RADIOLOGY

A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

PUBLISHED BY THE RADIOLOGICAL SOCIETY OF NORTH AMERICA

VOL. XII FEBRUARY, 1929 No. 2

THE USE OF GOLD-FILTERED RADON SEEDS[1]

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GOLD-FILTERED radon for interstitial irradiation has, at the time of writing, been used for two and a half years. As it is too early to compare results statistically, we propo e to compare the mechanical and physical ferences of the three methods for buried radiation, and to enumerate a few clinical observations. The three types of "seeds" now in use are the glass seeds, or bare tubes, the gold seeds, and the platinum removable seeds. The first two types are left *in situ,* even after the radio-activity is spent. The platinum tubes have strings attached, and are removed at the completion of the required irradiation.

Mechanically these applicators differ widely, a fact which is of prime importance in their clinical use. Trauma must be avoided as much as possible, other factors being the same.

The glass seed is by far the smallest applicator of the three types. It is 4 millimeters in length, and 0.3–0.4 millimeter in diameter. The wall thickness varies slightly, but it is usually less than 0.15 millimeter. Though the ends are rounded, there is no difficulty to implant these seeds, because of their small diameter.

The gold-filtered seed has a wall of 0.3 millimeter thickness, and a bore of 0.15 millimeter—the outside diameter, therefore, is 0.75 millimeter. The length is from 4 to 5 millimeters, but the added length does not materially increase the trauma. The ends of the gold tubes are not rounded, but flattened, with fairly sharp edges, due to the method of preparation. They are severed with cutting pliers, which have been purposely dulled.

The platinum removable seed for implantation is relatively large—necessarily so, because the radon is first collected in the capillary glass tube and this is inserted into the platinum container.

There are two sizes of platinum tubes: One has a bore of 0.6 millimeter and walls of 0.25 millimeter, making the outside diameter 1.1 millimeter; the other and more common type has a bore of 0.5 millimeter, with walls 0.3 millimeter thick; therefore the outside diameter of both sizes is 1.1 millimeter. The length is very close to 6.0 millimeters. The ends of these platinum containers are rounded, and one depends on the insertion of the trocar needle to separate the tissue, then withdraws a short distance before pressing the plunger.

The comparative sizes of the various types of seeds are given in millimeters:

	Glass	Gold	Platinum	
Wall thickness	0.15	0.3	0.25	0.30
Bore	0.10	0.15	0.60	0.50
Length	3.00–4.00	4.00–5.00	6.00	6.00
Outside diameter	0.40	0.75	1.10	1.10

From the comparison we see that the diameter of the gold seed is about twice that

[1]From the Service of Dr. Douglas Quick, Memorial Hospital, New York City.
Read before the Radiological Society of North America, at New Orleans, Nov 28–Dec. 2, 1927.

of the glass, and the platinum container is nearly three times the diameter of the glass seed. Comparing the platinum implant with the gold, the former is 68 per cent larger than the latter. The greater length of the metallic implants is of no serious consequence, for the increased trauma of insertion is of more theoretical than practical importance. Disregarding the greater diameter, it is hard to conceive that 2 millimeters extra length would add any trauma during the insertion of the seed.

Gold and platinum have practically the same absorbing power, their atomic weights being 197 and 195, respectively, and their densities 19 and 21. These are the essential properties which determine the amount of absorption.

Were this a purely physical discussion, equal amounts of radio-active material should be compared. But from a clinical aspect, it seems better to take the amounts of radium or radon which are commonly used, that is, 1 mc. in glass seed, and 2 mc. in gold. The platinum implants may contain a larger amount, and the duration of the treatment is gauged accordingly. In general, they contain about 3 mc. of radon. But this latter condition does not alter the physical phenomena, and the biological factors are changed only in so far as tissue changes vary with large amounts of radio-active material applied for a short time, or a small amount for a long time. It is highly improbable that the different amounts used in the gold and platinum applicators, as heretofore described, could have any apparent differences, either gross or microscopical, in their effect on the tissue.

The physical measurements of Failla and Quimby, and the experiments of Failla, Sugiura, Adair, and Cutler on rabbit muscle necrosis and butter decoloration form the basis for the radiation comparisons. As gold and platinum have the same absorbing powers, the 0.3 mm. gold seed and the glass seed will be compared. The figures for the gold seeds are applicable for the removable platinum seeds of equal wall thickness. The platinum seeds of 0.25 mm. wall thickness will not be included, for they have no advantage as to their outside diameter, and are less efficient in their filtration.

The steel needles containing small amounts of radium element will not be considered in this paper, for they possess all the disadvantages of the filtered seeds as regards size, with the added disadvantage that belongs to the glass seed, namely, inadequate filtration.

Assuming the radiation transmitted by the glass and the gold seed as 100 per cent, the relative amounts of beta and gamma rays are as follows:

	Beta rays	Gamma rays
Glass	96.5%	3.5%
Gold (0.3)	8.8%	91.2%

The total radiation transmitted by the gold-filtered seed is only 3.16 per cent of that which is transmitted by the glass seed. The question will arise here of the adequacy of the dosage with gold seeds. The answer is that with the glass seeds the dosage of beta rays adjacent to the seeds is far in excess of that amount of radiation necessary to destroy the growth. The intense beta radiation ceases more or less abruptly, leaving the more penetrating gamma rays to produce an effect at greater distances. With gold seeds, the beta effect is relatively little, but the double amount of radon practically doubles the amount of gamma radiation.

The amount of tissue necrosis that follows the implantation of radon in a glass or gold seed is worth serious consideration. We are familiar with the amount of necrosis caused by 1 mc. in a glass seed. Comparisons were made by burying different amounts of emanation in glass and gold in the lumbar muscles of rabbits. A glass seed of 1 mc. produced a region of necrosis with a radius of 3 millimeters. This was taken

as 100 per cent volume necrosis. A gold seed of 2 mc., buried in the same muscles, caused a radial necrosis of 1.8 mm., the volume of necrosis being only 21.5 per cent that of a glass seed of one-half the radon content. In other words, by using a gold seed of 2 mc., rather than a glass seed of 1 mc., twice the amount of gamma radiation is effective, and this is accomplished with only one-fifth the volume of necrosis.

The clinical discussion will be limited to a general description of the tissue reaction to the gold-filtered seeds, and an enumeration of a few of the principal locations and uses of these implants where glass seeds cannot reasonably be used.

To utilize the clinical experience gained from the use of the glass seeds, it is advisable to employ, for a given lesion, the same number of gold seeds as it was customary to use of the glass seeds, but the radon content should be about double. That is, if a glass seed of 1 mc. was formerly buried, a 2 mc. gold seed is now used. This is not an absolute rule, but a basis to which clinical judgment must be added. It might be well to mention that in especially large tumors consideration must be given to the fact that there is a greater amount of gamma ray from gold tubes, therefore a more distant effect. Consequently a slightly smaller total dosage is given, either by a few less implants, or a lesser amount in each implant. In other words, due consideration must be given to the "cross-radiation."

Since there is no especial difference in the technic of embedding gold and glass seeds, we shall describe only the outstanding clinical manifestations caused by the filtered type of implant.

There is the same immediate effect as to trauma as followed the embedding of the glass seeds, but apparently no greater, although the needles are somewhat larger. This reaction varies with the type of tissue in which the lesion is located. In the subcutaneous tumors, we see a slight inflammatory reaction, more marked at the site of the skin puncture, with the slight tenderness concomitant with moderate injury.

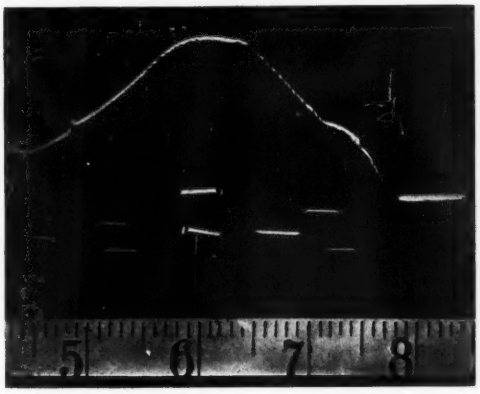

Fig. 1. Relative size of glass and gold seeds and removable platinum seed.

Mucous membranes give more evident signs of trauma, shown by the moderate edema surrounding the implanted area, and some discomfort, especially in the mobile parts, as the tongue and buccal mucosa.

When an ulcerated lesion is treated, there is an increased serous discharge. These reactions result from mechanical trauma, appearing shortly after implantation, and are not apparent after forty-eight hours.

The irradiation reaction of the tissue varies somewhat in its onset, according to the total dosage given, larger doses producing a more rapid effect.

The tissue reaction due to irradiation also varies according to the location. Chronologically the average dose makes apparent its effect in about five days. The skin over a subcutaneous newgrowth at this time becomes reddened as in any erythema dose of radiation, and in the more intense reactions there is a serous discharge, with encrustation. The duration varies with the dosage, but healing can be assured in from three to four weeks. To produce the same skin effect with buried glass tubes, there would necessarily be about ten times the amount of complete tissue necrosis within the tumor.

The mucous membranes react in from four to five days by swelling, discomfort in the sensitive areas, and marked increase of mucous discharge. This is followed in one or two days by a diphtheretic membrane well beyond the limits of the implantations. This shows very well the distance to which the irradiation is efficient, biopsy demonstrating the absence of newgrowth in this region. Nevertheless there is no gross destruction of the normal tissue. Mobile regions, as tongue or soft palate, become definitely uncomfortable, but not so much so as after treatment by glass seeds. This reaction reaches its peak in seven to eight days following the implantation, then progressively diminishes for about three weeks, depending on the total dosage. In tumors involving the mucous membranes gold implants have attained their greatest triumph over glass seeds, for with gold seeds in these locations, destruction of newgrowth has been accomplished with much less pain, showing no gross external tissue necrosis, with its consequent sloughing and danger of hemorrhage; nor is it necessary to frequently remove by cautery large portions of tissue, necrotic and normal, because of slough and infection. With gold seeds it is usual to obtain complete regression of the newgrowth, while the contour of the region remains nearly normal.

The main variation in the reaction of the ulcerated lesions treated with filtered radon is the regression without sloughing, even disappearance of the disease, followed by slowly proceeding epidermization of the area. It is well here to emphasize this point by mentioning deeply infiltrating basal cell carcinoma, especially the recurrent type—recurring subcutaneously, later ulcerating. Such a condition presents a difficult problem for radiation therapy. The ulceration, due to impaired blood supply, was increased, especially in its depth, by the caustic action of the beta rays from glass seeds. This ulceration was followed by tissue necrosis, stringy slough, infection, and long delayed granulation and healing. These same lesions treated with filtered radon now regress completely without necrosis, and with epidermization in a fraction of the time required for treatment by the former beta-ray therapy. Moreover, the resulting scar is softer, more movable on the underlying tissue, and nearer the normal contour and consistence, than could be obtained by the glass seed.

It is often found that a cancerous lymph node is contiguous to a nerve trunk or a large blood vessel. A glass seed placed within necrosing distance of a nerve would result in a severe neuritis or destruction of the nerve trunk. Though nerve tissue is resistent to radiation, it cannot withstand the caustic beta rays of radium. A quantity of gamma rays, just sufficient to destroy most types of neoplastic cells, will not permanently injure nerve tissue. The treatment of a growth near a large blood vessel by buried radon in gold seeds is now a safe procedure. The more even distribution of the filtered radiation permits of more adequate treatment without the necrosis of the vessel wall, hemorrhage into the surrounding tissue, and finally thrombosis of the vessel.

It is interesting to compare the older method of glass seed implants with the newer type of interstitial filtered radon by a brief enumeration of specific locations where the latter can be used safely and efficiently, while the former type would be impossible, or at least very hazardous.

The inner and outer canthus of the eye are common sites of basal cell carcinoma. This growth is locally malignant, infiltrating into deeper portions of the orbit beside the eye. It often necessitated the enucleation of the eye to cope with the disease, because external radiation is inadequate, and glass seeds were so destructive that implantations could not be attempted. Such a method of procedure would not only devitalize the bone of the orbit, but also destroy the rectus

muscle and even the eye, if it were within the necrosing distance. Now a gold-filtered seed may be buried in a growth with reasonable assurance of caring for the lesion, without untoward effect on the eye or the orbital wall. Many eyes have thus been saved.

In the intra-oral group of carcinomas, the advent of gold-filtered seeds has been an important advance in radiotherapy. Glass seeds, depending almost wholly on the caustic effect of beta radiation, caused widespread sloughing in areas treated. The blood supply of the oral region is profuse. It was therefore necessary to ligate the arteries supplying the treated area. This was necessary whether the necrotic mass was allowed to separate spontaneously or whether the condemned portion, together with some of proximal viable tissue, was removed by cautery. Besides adding a surgical procedure to the treatment of the patient, who is usually in rather poor physical condition, the operation of ligation left a scar in cervical tissues, and this was at the level of the carotid bifurcation. Metastases from intra-oral carcinoma most commonly occur at this level. This scarring makes later palpation of the neck for metastatic nodes more difficult. It is not advisable to routinely extirpate the cervical gland-bearing region, when no nodes are palpable. When the cervical metastatic nodes were in the operable stage, the arteries supplying the primary lesion were ligated at the time of dissection. In neither case is decreased blood supply to the region of the primary lesion beneficial. On the contrary, the sloughing and infection are more marked, and healing delayed. Gold seeds may be implanted in newgrowths in the region of the nutrient artery, with little or no infection, no sloughing, and with no fear of hemorrhage. It is not necessary to limit the blood supply.

This brief summary of the clinical effects of glass and gold seeds clearly points out the superiority of filtered implants. Platinum-filtered seeds offer the same advantage. In the care of patients every phase of the treatment must be considered. Glass seeds, though they served their purpose for a time, but only until a better method was devised, should be eliminated, for their only recommendation is the small size. This is more than compensated for by the better biophysical effect of filtered seeds. We have gold and removable platinum seeds from which to choose. Allowing gold seeds to remain in tissue has not caused any severe foreign body reaction. There has been no breaking down of tissue with persistent sinus. Platinum removable seeds, it is true, are left in place for a definite time before these foreign bodies are removed. The advantage of the removable type is of very little, if any, importance.

During the introduction of gold seeds there is some danger of infecting the deeper tissues by the passing of the trocar needle through non-sterile areas. This danger is transitory. The removable platinum implant requires a larger canal for introduction, and has a string attached, which acts very much as a surgical drain. In the treatment of oral lesions these strings are bathed in infected saliva, easily permitting retrograde drainage of infection into sterile tissue. This may not happen frequently, but it is a possibility that cannot be denied. If the foreign body reaction to gold seeds were too severe, or if platinum-filtered seeds were more efficient in point of filtration, the danger of infection by the attached thread could reasonably be ignored.

The immediate discomfort to the patient is also of consequence. Once the gold seeds are implanted, there is practically no pain until radiation reaction begins. The mechanical difficulty of a bundle of strings within the mouth and moving during speaking and swallowing, even when oral muscles are apparently at ease, is a matter of serious importance.

There are many locations where gold seeds are used that preclude the implanta-

tion of platinum removable seeds, either because the procedure is unsurgical, or impossible. It is necessary only to mention the implantation of radon following neck dissection for metastases from intra-oral carcinoma, to emphasize the bad surgical technic of leaving many strings protruding from the wound. This must be the method if removable implants are used. Moreover, the seeds must be inserted into the tissue at many angles, and withdrawal is through one opening. This necessitates much tissue trauma.

Very briefly, a few locations where it is impossible to use platinum removable seeds will be mentioned. Laryngeal lesions do not permit of an applicator with a string attached, which is a constant source of irritation as it passes through hypopharynx, pharynx, and mouth. Nor is it possible to insert the platinum type into the base of the tongue: even the posterior part of the tongue presents almost insurmountable difficulties. The junction of tongue and the tonsillar pillar is so situated that only with the greatest discomfort can a patient tolerate the treatment with the relatively large removable seeds. The gold seeds can be implanted in these locations with no more difficulty than in any part of the mouth.

SUMMARY

1. The gold seed is about twice the diameter of the glass seed; the platinum removable implant is nearly three times the diameter of the glass seed.

2. The gold and platinum seeds of 0.3 mm. filtration transmit 3.16 per cent of the total radiation transmitted by the glass seed, but the filtered implants screen out all but 8.8 per cent of caustic beta rays.

3. Filtered implants permit the employment of a double amount of gamma radiation, for they contain twice the amount of radon that is used in glass seeds.

4. Volume of tissue necrosis by filtered seeds is one-fifth that of glass seed, which has one-half the radon content.

5. Filtered seeds permit of the treatment of lesions in which it is impossible to use glass seeds, and all implantations of filtered seeds cause less painful reactions.

6. Infection and slough are minimized by filtered seeds, and final healing is more rapid.

7. Gold seeds, though the same as platinum physically, are vastly superior mechanically, safer surgically, and the actual application is much less uncomfortable to the patient. They may be implanted where the use of platinum removable seeds is impossible.

BIBLIOGRAPHY

FAILLA, G., and others: Dosage Study Relative to the Therapeutic Use of Unfiltered Radon. Am. Jour. Roentgenol. and Rad. Ther., January, 1926, XV.

FAILLA, G.: The Development of Filtered Radon Implants. Am. Jour. Roentgenol. and Rad. Ther., December, 1926, XVI.

CUTLER, MAX: Comparison of the Effects of Unfiltered Radon Tubes Buried in Rabbit Muscle. Am. Jour. Roentgenol. and Rad. Ther., December, 1926, XVI.

DISCUSSION

DR. ALBERT SOILAND (Los Angeles): Dr. Duffy's paper gave a splendid analysis of the value of the different tubes. I note, also, his conclusion that the gold and platinum implants were much to be preferred to the glass seeds. There are, of course, instances where one is better than the other. If we can bury glass seeds in a location where no post-radiation harm can accrue, this method is undoubtedly superior. When we implant a platinum or gold seed or needle, particularly in the mouth or throat, with a string attached to it, and the string breaks or becomes detached (which is not unusual), the patient is frequently alarmed and sometimes we get into trouble, particularly if infection follows the string into the tissue. We have had a number of such uncomfortable experiences, and I am sure that my associate, Dr. Costolow, will bear that out.

DR. DUFFY (closing): I think I should emphasize again the relative sizes of the three types of implants. The gold tubes are nearly double the diameter of the glass seeds, and the platinum removable seed approaches a diameter almost three times that of the glass seed.

We are open to severe criticism if we use large size implants when no greater benefit is derived from the filter. Though the platinum seed is considerably larger than the gold seed, the wall thickness is the same. Platinum and gold are practically the same in density and atomic weight.

Dr. Withers recommends surgical exposure of an inoperable cervical mass. We believe this is the more reasonable method, rather than to attempt to locate the seeds properly through skin puncture. But, unless the removable seeds are implanted in the same axis, the trauma of withdrawal is severe. The alternative procedure is to leave the wound open. This is decidedly unsurgical.

Though the platinum seed of 0.5 mm. wall thickness permits the use of pure gamma radiation, with no surrounding necrosis, the advantage is not commensurate with the almost intolerable discomfort of wearing for several days the large implants, the strings of which are protruding from the puncture holes and the mouth.

Dr. Soiland spoke of the gold and platinum seeds with strings attached: our gold seeds have no strings, but are left *in situ* as were the glass seeds.

DIVERTICULA OF THE SMALL BOWEL[1]

By EDWARD L. JENKINSON, M.D., CHICAGO, ILLINOIS

THE subject of this paper has been covered very thoroughly by many writers. Some years ago Dr. James T. Case reviewed the literature on the subject and discussed it in detail. Later on, Dr. E. Wyllys Andrews reported a number of cases. We do not wish to claim anything original, but merely a further study, or, rather, discussion of a subject which to our mind is very interesting.

A diverticulum is a pouch or *cul de sac*, whether normal or abnormal, leading from a main cavity. Diverticula may be due to traction or pulsion, and may be congenital or acquired. There are true, false, or pseudo-diverticula. In the small bowel, they usually occur near the mesenteric attachment. According to Stengel, they owe their origin to localized weakness or separation of the muscle fibers of the bowel. Protrusion of the mucosa takes place, probably due to increased pressure from within; the pouch is, therefore, a hernious protrusion of the mucosa and serosa.

It has been our experience to find extra-luminal shadows in the second part of the duodenum rather common. Diverticula of the jejunum and ileum have been found very infrequently in our routine work, a fact which may not be due, however, to the infrequency of the lesion, but to the difficulties encountered in making a satisfactory study of these parts of the gastro-intestinal tract. In the large bowel, diverticula are met with very frequently, the sigmoid and the descending colon being the favorite locations.

In reviewing many thousand gastro-intestinal examinations done during the past ten years we have identified only three cases of diverticula of the small bowel beyond the duodenum. Two of these cases showed a single diverticulum in the jejunum and the other showed multiple lesions in the jejunum and ileum (proved at operation). This last case will be taken up in detail later on in the paper.

In going over many cases of duodenal diverticula we have been impressed with the frequency of accompanying diverticula of the large bowel. In our series of some fifty cases of diverticula of the duodenum, a large number have also had extra-luminal shadows in the large bowel. It may be that there exists a constitutional predisposition to their formation: it may be that there is some defect in the muscle of the bowel at the site of the blood vessels or ducts, as these are the favorite locations for their development.

In reviewing the histories of these patients showing diverticula of the duodenum, we have been particularly impressed with the close resemblance of their symptoms to those due to duodenal ulcers. Most of the patients complain of some form of gastric distress. The usual clinical diagnosis accompanying these patients to the roentgen department is duodenal ulcer. It is not uncommon to find the symptoms quite typical of an ulcer; at other times the symptoms may be vague or absent. These patients may show a definite point of tenderness on palpation. On physical examination, it is often difficult to anatomically localize the lesion. If it is in the second part of the duodenum near the bulb, it is often confused with a duodenal ulcer; if it is in the third part of the duodenum, it may lie over the pancreas. It is the general rule, however, to localize the point of tenderness as that of a duodenal ulcer. Epigastric pain is a com-

[1]Read before the Radiological Society of North America, at the Thirteenth Annual Meeting, at New Orleans, Nov. 28–Dec. 2, 1927.

mon complaint. It is not uncommon for the patient to complain of sour stomach, or regurgitation of sour food which burns the throat. The gastric analysis commonly shows a hyperacidity. These patients often give a history of the pain being relieved by the taking of sodium bicarbonate. In other patients, alkalies have no effect upon the pain.

The question is often asked by the attending physician, Why is not that pouch-like deformity due to a penetrating ulcer? We believe the question to be a just one, and possibly some or even a great many so-called diverticula are in reality penetrating ulcers. In our experience, penetrating ulcers usually show rather irregular edges, which, on close examination, are not so sharply defined as are diverticula. If, however, a diverticulum becomes infected, and a diverticulitis follows, the lesions may become identical. If a peridiverticulitis follows, the lesion may become adherent to the surrounding tissues. We call to mind distinctly a certain patient suffering from vague epigastric pain. Upon examination, we found an extra-luminal shadow, the lesion being on the lesser curvature side of the second portion of the duodenum and fixed in the region of the head of the pancreas. This patient was later operated upon, and, due to the dense adhesions, it was thought best not to try to remove the lesion as it was embedded in the head of the pancreas. A gastro-enterostomy was done and the pylorus closed. The patient has been well since the operation.

The commonest location of diverticula is in the second part of the duodenum on the lesser curvature side, or, in other words, pointing toward the stomach and pancreas. The pouch-like deformities usually measure from 5 mm. to 2 cm. in diameter.

The roentgen examination of the second portion of the duodenum is not always an easy one. It is often difficult to displace the stomach upward so as to visualize the entire duodenum. In some individuals the duodenum turns abruptly upward and is located high behind the stomach. We have found the left lateral in the upright position of value and the straight right lateral in the prone position the best for complete visualization of the duodenum. It is also important to close the duodenum by pressure of the palpating hand. In this manner the bowel can be better visualized and extra-luminal areas filled with the barium suspension. In many patients these pouch-like areas will empty rapidly, making a careful study difficult. From our experience, we are inclined to believe that these rapidly emptying diverticula cause few, if any, symptoms. They are empty the greater part of the time and it is rather unlikely that an infection or an inflammation would develop when the drainage is free. In the diverticula that harbor food for long periods of time, symptoms, we believe, would be more apt to develop. Although these suppositions sound reasonable, they are not always true. We have seen patients with large free-draining diverticula produce the most symptoms, or, at least, the patient complained of the greatest discomfort.

During the fluoroscopic examination, it is not uncommon to observe a spastic pylorus. This spasm of the pylorus may account for the large residue in the stomach at the end of six hours, a condition encountered in some patients. It is not uncommon to see definite surging and stasis in the duodenum of these cases.

Dr. Evarts A. Graham, in a recent paper, covered the subject thoroughly. He was impressed with the frequency of these pouch-like shadows seen in the routine gastro-intestinal examinations made at Barnes Hospital, and thought that perhaps some of the indefinite symptoms referable to the right upper quadrant in the absence of pa-

thology in the stomach, duodenal bulb, or gall bladder, might be due to these diverticula. On operation, he went on to say, these areas were difficult to locate. The cases operated upon did not show the classical picture of a diverticulum. The areas were definite sacculations. The mucosa, muscle, and serosa bulged or were sacculated. There was no separation of the muscle; in fact, the muscle formed part of the sac. Many of the pouches were formed by adhesions secondary to gall-bladder lesions.

The question is often asked, Why did not the examiner find that pouch? We believe the fact that the lesion is sometimes missed is not due necessarily to a careless examination, but to the fact that the pocket may have been filled with food material, or, perhaps, due to spasm, the barium was not allowed to enter. Occasionally the diverticulum cannot be outlined at the first observation of the examination, and becomes apparent only at the five-hour observation. The pocket may have been filled during the first part of the examination and may have been drained later by the passage of the barium suspension. As the food left the sac, the barium worked its way in and outlined the area. Only recently, we located a diverticulum measuring about 2 cm. in diameter in the second part of the duodenum that had not been identified at a gastro-intestinal examination a month previously, by a highly competent roentgenologist in one of our leading clinics. The shadow did not show under the fluoroscope at the time of that examination. It is our opinion that the pouch was filled with food all during the examination, and the barium could not enter. If there has been inflammation, a definite diverticulitis may develop and the lesion become adherent to the surrounding tissues.

We do not wish to convey the idea that we believe all patients with extra-luminal shadows in the duodenum have symptoms. On the contrary, we believe many of these patients have no symptoms. It is not uncommon to find a diverticulum in a young individual with absolutely no symptoms. However, it seems reasonable to believe that these areas are potentially trouble-makers. If at any time these pockets become irritated and infected, symptoms may follow, symptoms which may be very marked or consist of only indefinite gastric distress. After a careful review of many histories, we must admit that the majority of patients showing diverticula do complain of symptoms. It is true, they are not entirely characteristic of the lesion, but, nevertheless, they are symptoms. We do not believe there is a definite symptom-complex as there is in duodenal or gastric ulcer, but even in these lesions the symptoms are often atypical and vague. As we have mentioned previously in this paper, the symptoms depend upon how well the pouches drain or empty themselves. Frequently a diverticulum can be outlined for many hours following ingestion of a barium meal—we have often seen residues in diverticula for forty-eight hours.

The treatment of these cases in our hospital has usually been medical. They are put on a rigid diet—practically an ulcer management. The food should be mostly liquid during the period when the symptoms are at their height. Alkalies are also of great value in some cases. The idea is to give non-irritating foods with plenty of fluids to promote drainage of the pouch. Quite recently, one of our surgeons operated upon one of our female student nurses in her early twenties for a large diverticulum of the duodenum (second part). The diagnosis was made during a gastro-intestinal examination. Her symptoms were rather indefinite as to the localization, although quite severe and constant. On admission to the hospital, she complained of sharp epigastric pain, severe for about one and one-half

hours, three hours after eating. The pain was exaggerated on deep inspiration or by exercise, and was not influenced by bowel movement. Gastric analysis was as follows: Free acid 35, combined 34, total acidity 69. The blood and urine were negative. The blood Wassermann was clearly negative. There was no blood in the stool or gastric contents on several examinations. On April 3, 1925, the patient's appendix was removed: it showed a few concretions. Convalescence was uneventful. On May 8, 1926, the patient again complained of epigastric pain. The gall bladder was visualized and showed a normal response. On June 8, 1926, the gastro-intestinal tract was examined and a large diverticulum in the second part of the duodenum was found. The following day, the patient was operated upon. Operative procedure was as follows: Through a right rectus incision, a diverticulum about 1 cm. in diameter was removed from the second part of the duodenum. Adhesions were freed and the diverticulum clamped and excised. The opening in the duodenum was closed with three layers of chromic catgut. The pathologist's report was as follows: Microscopic section through the wall disclosed intestinal epithelium, mucous glands, and layers of smooth muscle such as is found in the small bowel. In places, there was slight lymphocytic infiltration and connective tissue, but no other histological changes were noticed. At present the patient is back on duty, much improved, but still on a diet of rather soft food. She was examined after the operation and the diverticulum could not be located; there were, however, adhesions to the lesser curvature side of the bulb.

Diverticula of the jejunum and ileum are not so common as diverticula of the duodenum; at least, that has been our experience. Possibly the lesions are just as common, but their location makes them more difficult to identify. Diverticula of the jejunum and ileum are usually multiple. As mentioned earlier in this paper, we have identified three cases of diverticula of the small bowel beyond the duodenum. One of these patients was operated on and the lesions clearly demonstrated.

The symptoms are indefinite, with no special localization, the most common being epigastric distress accompanied by eructation of gas. The symptoms usually date back a number of years, during which period there has often been intermittent vomiting. A troublesome diarrhea, which has persisted for years, is also a common symptom. The patient complains of a progressive weakness and loss of weight, and the usual diagnosis is carcinoma. The following report is of a case diagnosed multiple diverticula of the jejunum and ileum (proven at operation).

CASE REPORT

The patient, a white male, 59 years of age, came to the hospital complaining of epigastric distress dating back three years. There had been intermittent vomiting and diarrhea for that period, while during the last six months there had been a great loss in weight and the patient had become very weak. He was poorly nourished and under weight, but quite well developed. He gave a definite history of three years' duration, during which time symptoms had developed slowly but progressively. At the time the patient was admitted to the hospital they were at their height, and practically no food could be retained.

The heart was slightly enlarged and somewhat irregular: the liver was slightly enlarged. The urine was negative. Blood count: Red cells 3,440,000; white 7,300; hemoglobin 62 per cent. The X-ray examination of the chest showed no evidence of metastasis in the lungs or ribs. The X-ray

examination of the gastro-intestinal tract showed many pouch-like deformities in the jejunum and ileum, ranging from 1 to 3 cm. in diameter. There was marked stasis in the small bowel at the end of twenty-four hours.

The patient was operated upon May 5, 1927, a left central incision being made. Beginning about 18 cm. below the duodenal-jejunal junction, there were numerous small diverticula about the size of a pea. The diverticula extended down the jejunum for a distance of about five feet, becoming progressively larger until they attained the size of a small egg. All the diverticula communicated with the bowel by rather large openings. No attempt was made to resect the bowel, as the involvement was too extensive. The abdomen was closed in layers. Post-operative convalescence was uneventful and the patient was discharged May 22, 1927. At the present time he still complains of the same symptoms as before, and is much weaker and emaciated.

CONCLUSIONS

1. Diverticula of the duodenum are rather common.
2. A definite symptom-complex does not accompany diverticula of the duodenum.
3. In the cases diagnosed, there would seem to be a constitutional predisposition to the formation of diverticula in the gastro-intestinal tract.

DISCUSSION

DR. JAMES T. CASE (Battle Creek, Mich.): The subject of Dr. Jenkinson's paper is one in which I have long been interested, having reported some of the first cases which came to operation. There are some duodenal diverticula which cannot be demonstrated radiologically because they have wide orifices. When the orifice is wider than the diverticulum itself, naturally there is no chance for the diverticulum to become manifest, because it does not retain its opaque contents. It can be filled only when one manipulates the duodenum to block it and imprison its contents, thus forcing the opaque material into the diverticulum. These diverticula can be seen fluoroscopically but they are not easily detected on the film. The smaller the orifice, the more likely is retention to occur and the more possibility of showing up the diverticulum. I am sure many go undiscovered because they have wide orifices.

For those diverticula which occur near the ampulla of Vater, I am somewhat hesitant about recommending surgery, for the reason that I once encountered one of these diverticula where the pancreatic duct and the common duct emptied into the diverticular sac, and I know of no way to positively tell in advance whether or not this situation exists. Possibly in such a case the opaque material should penetrate the pancreatic or common ducts. This occurred in a case reported by Akerlund. I think most of these larger diverticula in the neighborhood of the ampulla of Vater are really "paravaterian" diverticula. The surgeon cannot tell in advance just what he may want to do in such a case.

Jejunal diverticula are interesting and may go undiscovered. Just the other day I was making a search in the upper part of the jejunum and I found at least twelve or fifteen small diverticula of the type Dr. Jenkinson described. They were possibly two centimeters deep and one or two were large. They had been missed in our pre-operative roentgen examination. I believe there is better chance to discover jejunal diverticula when the patient is examined in the upright position.

DR. JENKINSON (closing): I have nothing further to add, save to emphasize what Dr. Case has said. I think it is true that

many of these diverticula are located in the second part of the duodenum. I would like to know how to differentiate them from penetrating ulcers.

Roentgenology of the Colon: Its Value in Clinical Medicine. J. W. Larimore. Am. Jour. Roentgenol. and Rad. Ther., August, 1928, XX, 101.

Roentgenology of the colon was first utilized for the recognition of pathological anatomy, but is now being used more widely for the recognition of abnormal physiology. Variations in anatomy may make for pathological physiological tendencies.

The commonest altered function of the colon is that of motility resulting in constipation or diarrhea. Roentgenologic observation has demonstrated the atonic type to be more frequent than the spastic. Constipation may be a right cecocolic, a distally impaired motility, or a rectal delay. A hyperrotation of exaggerated length of the right colon associated with pelvic position of the cecum was observed in 13 per cent of 562 individuals. This anatomical variation may be associated with cecocolic delay, giving rise to such symptoms as constipation, headache, and local pain.

The author found a redundancy of the sigmoid segment in 18 per cent of his cases, a variation associated frequently with motor impairment and often resulting in constipation, abdominal discomfort, vomiting and diarrhea, and an intermittent tumor.

Generally impaired colonic motility due to an over-distention of the musculature is serious only if of long standing; if of short duration the intrinsic tone of the muscle will overcome the dilatation and stasis, if the colonic content is kept soft.

The author has seen many cases of claimed constipation wherein the roentgenologic findings will show normal length, tonus, and topography of the colon, yet the patient may be a laxative habitué. The indicated treatment in such cases is the withdrawal of laxative. Such a colon should resume a normal function without the assistance of drugs.

Hypertonicity of the colon at first produces normal or over-prompt motility, and only when exaggerated will there result a spastic delay.

Vitamine deficiency in the diet will result in impaired colon function, which may initiate the vicious circle of general avitaminosis, which, in turn, allows the penetration of pathogenic bacteria through the bowel wall. The early manifestations are excess mucus and hyperperistalsis, which eventually become a chronic ulcerative colitis.

J. E. Habbe, M.D.

FRACTURES OF THE SHAFT OF THE FEMUR[1]

By WILLIS C. CAMPBELL, M.D., MEMPHIS, TENNESSEE

FRACTURES of the shaft of the femur occur with great frequency, and rank high among the permanently disabling injuries. Many methods have been devised for the treatment of such fractures but we are still far from the adoption of a standard procedure. As in all surgical problems, each case requires special solution by the surgeon, taking into consideration the merits of the case and his personal ingenuity in the application of the various methods, and also the social and financial circumstances of the patient. The three chief methods of treatment in vogue at the present time are:

(1) Traction and suspension with or without skeletal traction.

(2) Open reduction with or without internal fixation.

(3) Manual reduction maintained by external fixation.

The first and second methods will be dismissed with brief mention, as we are largely concerned in the discussion of the third method. The traction and suspension method is the one used most extensively in the large industrial centers, because of its relative ease of application, and because very few general surgeons are really adept in the use of plaster-of-Paris. Open reduction is necessary at times in very muscular individuals, and occasionally in those rare instances in which closed reduction is impossible because of interposition of muscle tissue. The additional operative risk, however, especially when foreign material is used for internal fixation, makes the operation unsuitable for routine practice.

When properly employed, manual reduction of the fracture followed by immobilization in a plaster-of-Paris cast is the most reliable procedure. A poorly applied cast, or one composed of poor plaster, is worse than no treatment at all. It does not hold the bones in position and obscures deformities which might otherwise be seen and corrected. One warrantable objection to the plaster cast is that the knee and ankle joints are necessarily immobilized for a long period of time. This tends to cause atrophy of the articular cartilages and contractures of the soft parts about the joints which may result in permanent limitation of motion. Children recover full motion in a few weeks and in adults seen and treated early we have had no serious difficulty in restoring motion to the joints. In arriving at a conclusion concerning permanent impairment of joint function brought about by prolonged immobilization, a period of six months should elapse after the cast is removed, before final judgment is passed. Many apparently stiff joints clear up almost entirely with appropriate physiotherapy and active and passive motion. Neither is normal range of motion necessary to perfect function. A painless knee capable of 90 degrees flexion and full extension will give practically perfect function.

This discussion is limited to the consideration of simple fractures of the shaft of the femur, seen either immediately after the injury or within the first week or ten days. It does not include intertrochanteric or peritrochanteric fractures, fractures involving the knee joint, or epiphyseal separations, as these conditions present different surgical problems and should not be confused with fractures of the shaft. Simple fractures of the shaft may be classified according to their location, as upper third, middle third, and lower third, and as oblique, transverse, and comminuted.

[1]Read before the Radiological Society of North America, at the Thirteenth Annual Meeting, at New Orleans, Nov. 28–Dec. 2, 1927.

Fig. 1. Transverse fracture of femur with comminution of lower fragment, showing displacement and over-riding. Antero-posterior view.

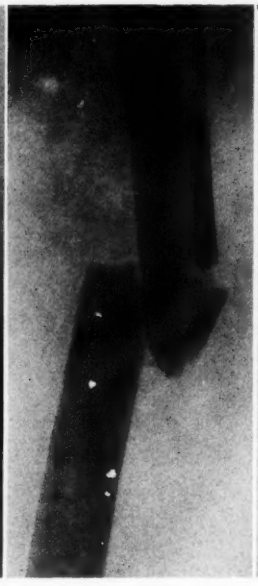

Fig. 2. Same as Figure 1, lateral view.

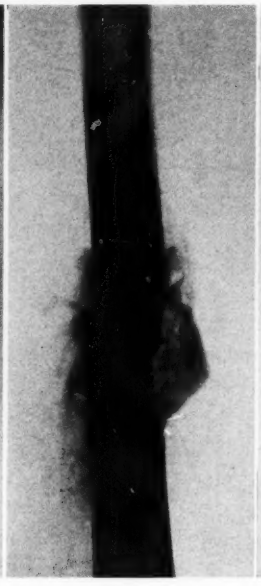

Fig. 3. Result following end-to-end engagement, with solid union.

Fig. 4. Same as Figure 3, lateral view.

Fractures should be reduced as soon as possible to prevent swelling and ill placed callus, which interfere with reduction. Callus once broken up never forms as rapidly again, and repeated reductions and disturbances of callus constitute the most common causes of non-union. In 99 per cent of cases, a plaster cast may be employed with perfect safety in fractures of the femur before swelling takes place. If excessive swelling is present when the case is first seen, reduction is postponed in order to make the manipulation easier and to prevent the cast from becoming loose when the swelling recedes. The ideal technic in the treatment of all fractures should be directed toward securing the maximum function with the minimum trauma to the bone and soft structures. The first and most important factor in reduction is anatomical alignment, which can be obtained in almost every case and must be maintained. The second essential is the approximation of the fragments, or end-to-end engagement when possible. End-to-end approximation means the engagement of sufficient surface of the fragments to maintain alignment of the limb. It is not an equation of two-thirds, one-half, or one-fourth, but if one-sixteenth of the surface of the fragments can be engaged and persistently maintained the result will be satisfactory; not the amount in contact but the stability of the engagement, or locking of the fragments, is the factor of importance.

The actual anatomical relation of the fragments, especially as to angulation, may not be apparent unless the roentgenogram covers a field of sufficient dimension. The film should be large enough to demonstrate the full length of the bone involved. Despite the impetus given to fracture surgery

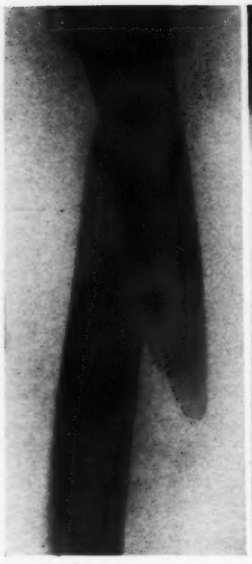

Fig. 5. Spiral fracture, upper third of femur. Antero-posterior view.

Fig. 6. Same as Figure 5, lateral view.

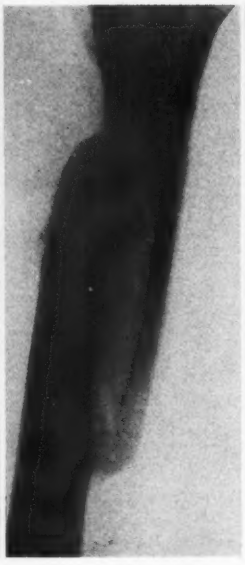

Fig. 7. End-result, showing solid union. Antero-posterior view.

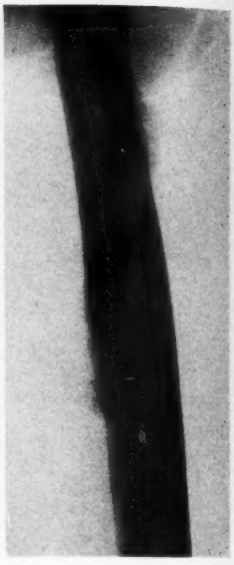

Fig. 8. Same as Figure 7, lateral view.

by the advent of the roentgen ray, the fact remains that its general acceptance, especially in the hands of those untrained in its use, has retarded advance in the treatment of fractures. Too often there are repeated efforts to accomplish a perfect anatomic and roentgenologic result at the expense of injury and trauma to the bone and soft structures.

TREATMENT

An orthopedic table, with the usual attachments for extension and countertraction, is essential. In addition, an X-ray equipment in the operating room to allow frequent fluoroscopic examination and plate control while the fracture is being reduced, assures an exact knowledge of the position of the fragments before the cast is applied. The patient is given a general anesthetic, and when the muscles have become thoroughly relaxed, the manipulation is begun. The deformity usually seen is forward displacement, with slight abduction of the upper fragment. This is due to the pull of the psoas, iliacus, pectineus, and abductor muscles of the thigh, which have their insertions around the greater and lesser trochanters. The unaffected limb is fixed under moderate traction. The affected thigh is then flexed about 45 degrees and slightly abducted, as this is the usual position for the upper fragment to assume because of the pull of its muscular attachments. Little control of this fragment is possible, particularly when it is short, and the lower fragment must be brought up to meet it. The fragments are angulated under slight traction until the ends of the bone impinge and can be locked, after which the thigh is straightened until normal antero-posterior and lateral alignment is obtained. If the fragments slip by one another, the maneuver

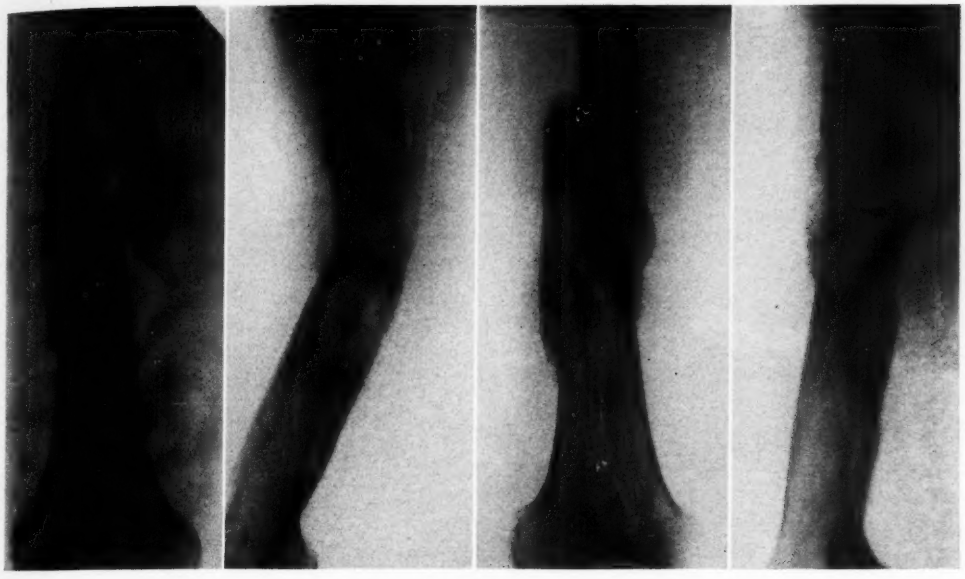

Fig. 9. Comminuted fracture, lower third of femur. Antero-posterior view.

Fig. 10. Same as Figure 9, lateral view.

Fig. 11. Solid union, with good alignment. Antero-posterior view.

Fig. 12. Same as Figure 11, lateral view.

must be repeated until there is the definite resistance of impingement of the fragments and locking. At times there may be some difficulty in making sufficient extension to secure end-to-end apposition of the fragments until the muscles are thoroughly relaxed. In resistant cases extensive forcible traction on the fracture table for five minutes is of value, after which the manipulation may be resumed. The relation of the fragments is checked with the fluoroscope and the limb fixed in position. Traction is made on the foot and countertraction under the knee and at any other place required. A plaster cast is applied, extending from the nipple line to the toes on the affected side and to the knee on the unaffected side, with a cross-bar between the knees.

Transverse fractures with several sharp points and notches on the fragments are the easiest to reduce and hold in position. Impingement and locking of the fragments is usually not difficult, and, once firmly locked, there is relatively little tendency to slip. The most difficult fracture to retain is the short, smooth, slanting break, which, by the absence of opposing surfaces, is almost impossible to lock at the time of reduction and is liable to slip during the first week after application of the cast. One or two manipulations may be required in this class of case before a satisfactory position is obtained. Our custom is to take a roentgenogram at the end of the first week, and, if slipping has occurred, a remanipulation is performed. Later, when the second cast is applied, if there is any shortening, traction is made with the application of the cast. With this technic equally satisfactory functional results are secured as in cases where interlocking is secured.

The same procedure may also be employed in long oblique fractures and in comminuted fractures. In this class we must at times be satisfied with one-half to one inch overlap and shortening, provided the

external alignment is good. We believe it is better for the patient to have a straight leg one inch short than to subject him to the dangers and uncertainty of an open reduction, which, regardless of the type of internal fixation used, does not give 100 per cent successful results. An inch shortening may easily be compensated for by tilting of the pelvis, and the functional result will be entirely satisfactory. Experience with several thousand fracture cases has convinced us that, while perfect anatomic reduction should be our ideal, and every justifiable means used to obtain such reduction, a good functional result is what the patient desires, and his life and limb should not be endangered to obtain roentgenograms which demonstrate perfect anatomic reduction.

The roentgenogram alone should not determine the progress of the case, but inspection of the entire limb for any change in contour must be made at intervals until consolidation is complete. Repair, which is, of course, more rapid in children than in adults, begins in from two to four days and is active at the end of ten days. In children, the cast is removed at the end of two weeks, and in three to four weeks in adults, after the alignment of the leg has been carefully inspected and the position of the fragments checked by the roentgen ray.

The value of the roentgenogram at this time lies in the determination of the relation

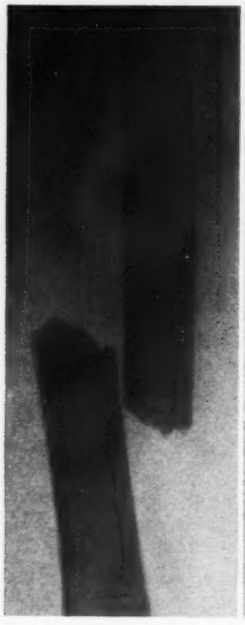

Fig. 13. Transverse fracture, mid-third of femur, with displacement and over-riding of fragments.

Fig. 14. Same as Figure 13, after treatment, showing solid union. Antero-posterior view.

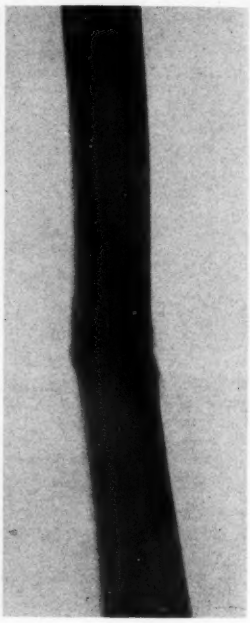

Fig. 15. Same as Figure 14, lateral view.

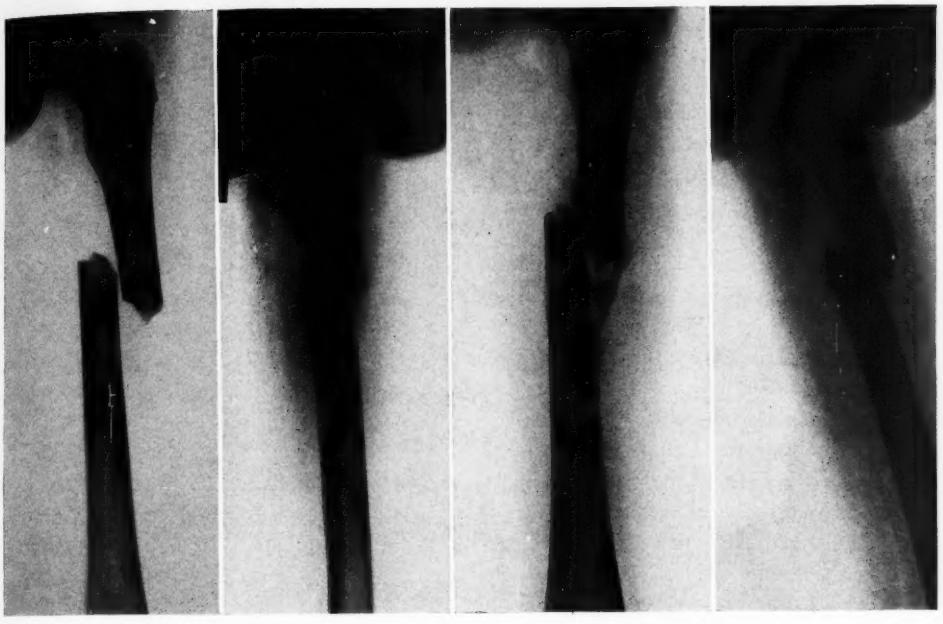

Fig. 16. Fracture at junction of mid- and upper third of femur. Antero-posterior view.

Fig. 17. Same as Figure 16, lateral view.

Fig. 18. End-to-end engagement, with callus and beginning union. Good anatomic alignment. Antero-posterior view.

Fig. 19. Same as Figure 18, lateral view.

of the fragments, rather than union, for not until there has been complete consolidation with organization will the roentgenogram demonstrate that union is solid. The clinical signs of union are apparent much earlier than the X-ray manifestations. In children, callus is demonstrable much earlier than in adults, and, as union is usually rapid and rarely delayed in children, the question of callus formation is not important.

Any angulation can easily be corrected while the callus is malleable and the position of the joints can be changed; that is, the degree of flexion or extension can be increased or decreased, thus preventing future stiffness. Careful observance of this simple precaution will often save much embarrassment in the future after solid union has taken place. A second cast is now applied, usually including only the injured limb, if there is satisfactory union and good position. This cast is worn an additional two or three weeks, depending upon the age of the patient and the amount of union. The usual period of immobilization in children is from four to six weeks. In adults, the second cast is allowed to remain on an additional four to six weeks, thus making the total period of immobilization from eight to ten weeks, depending upon the age of the patient, his ability to produce callus, and the position of the fragments. After the cast has been removed the patient is fitted with a suitable brace, which is worn from two to six months, or until solid union with complete organization of callus can be demonstrated clinically and by the roentgenogram.

In older children and adults, physiother-

apeutic treatment is instituted to restore motion to the knee and other joints.

RESULTS

In summarizing the results obtained by the method under consideration differentiation must be made between children and adults—the age of fifteen has been arbitrarily chosen as the dividing line.

Results in Children.—Three cases in children were birth fractures, in which the fragments could not be maintained in apposition; in fact, there was wide separation. A simple malleable splint made to fit the contour of the infant in the sitting posture was applied, extending from the scapula to the toes, and conforming to the contour of the posterior aspect of the spine, thigh, calf, and sole. External anatomic alignment was maintained and the results in all were perfect.

In older children, all recent fractures have received the routine treatment, as described. There were 77 cases in this group. With the exception of four, only one reduction was necessary in each case. In three cases a second reduction was done because end-to-end approximation had slipped, with overlapping of the fragments. In one case the second manipulation was for correction of angulation. In 68 cases there was no shortening, or less than one-fourth inch; two cases had one inch shortening. The results were excellent in 74 and good in three. All had solid union, and perfect function of the joints.

Closed manipulation is the ideal method to be employed in children, as the patient can be removed to his home within a few days after reduction, with little danger of displacement of fragments. The child becomes accustomed to the cast within a few days. Other methods, such as dangling a child from the ceiling, require enforced diligence on the part of all concerned and great patience and endurance on the part of the child.

CHART I

RESULTS IN CHILDREN

Location	
Upper third	20
Mid-third	43
Lower third	14
Total	77
Oblique	22
Transverse	49
Comminuted	6
Total	77
Shortening	
1 inch	2
¾ inch	2
½ inch	5
¼ inch or less	68
Total	77
Number of reductions	
One time	73
Two times	4
More than two times	0
Total	77
Results	
Excellent	74
Good	3
Fair	0
Total	77

Results in Adults.—The actual problem of fracture of the femur arises in adults. There were 71 cases in this group, ranging in age from fifteen to seventy-five years. In 23 cases the fracture was in the upper third; in 28 it was in the middle third, and in 20 in the lower third.

Twenty-five of the fractures were oblique, 31 transverse, and 15 comminuted. All cases received treatment as above outlined. In 52 cases, or 73 per cent of the series, there was one-fourth inch or less of shortening; in 8 cases there was one-half inch;

in 6 cases three-fourths inch, and in 2 cases there was one inch shortening. Three cases had as much as one and one-half inch shortening. All had solid union and all patients had straight legs as an end-result.

In 66 cases, or 93 per cent, only one reduction was required. Five cases required the second reduction, either because the fragments had slipped or for the correction of angulation. No case required more than two reductions and no case required an open operation.

In attempting to determine the final result in these cases we have taken into consideration several factors, such as the amount of shortening, the appearance of the limb, function in the knee and ankle joints, and the degree of motion. In no case seen and treated early have we had serious difficulty in restoring motion in the joints. The most important factor is shortening. Classifying the results on this basis, we have tabulated them as shown in

CHART II

RESULTS IN ADULTS

Location	
Upper third	23
Mid-third	28
Lower third	20
Total	71
Oblique	25
Transverse	31
Comminuted	15
Total	71
Shortening	
1½ inches	3
1 inch	2
¾ inch	6
½ inch	8
¼ inch or less	52
Total	71
Number of reductions	
One time	66
Two times	5
More than two times	0
Total	71
Results	
Excellent	52
Good	16
Fair	3
Total	71

We feel that these results by closed reduction and external fixation in a cast are as satisfactory as those obtained by any other method, and that they justify the more general adoption of this technic in the treatment of fractures of the shaft of the femur.

IODIZED OIL IN ROENTGENOLOGY[1]

By LEWIS J. FRIEDMAN, M.D., Roentgenologist, Bellevue Hospital, NEW YORK CITY

STARTLING revelations have been made in almost every branch of medicine and surgery in the past decade, but few have attracted the attention of the medical profession as has the use of a contrast medium in roentgen diagnosis. While the iodized oils have almost unlimited uses, a few words of caution and some modifications in the technic are essential after almost five years of experience, accumulated from an extensive literature and personal observation.

The oil originally employed by Sicard and Forestier (1) is known commercially as Lipiodol Lafay. It is a tasteless and practically odorless amber-yellow[2] vegetable oil (oil of poppy) containing 40 per cent by weight of iodine in chemical combination with the fatty acids.

Iodipin, another preparation which can be used with impunity, is a yellowish brown oil (oil of sesame) also containing 40 per cent of iodine by weight. Its specific gravity is 1.370, while that of lipiodol is 1.350.

The advantages of the oils named above may be summarized as follows: (1) Markedly radiopaque; (2) Proper viscosity; (3) Viscosity may be reduced by diluting with warm mineral oil; (4) Non-toxic (see below); (5) They may be sterilized in a water bath without decomposition[3]; (6) Of therapeutic value.

T. J. Putnam (2) reported on the physical characteristics of iodized oils, employing the following as diluents and menstruums: Rapeseed oil, castor oil, linseed oil, neat's-foot and lard oil, porpoise oil, parsley seed oil, and spermacetic oil.

Binet and Verne (3) reported on the rapid absorption of animal oils by the subcutaneous tissues of a rabbit. This experiment obviously precludes the possibility of using the animal oils owing to their rapid absorption. On the other hand, some of the vegetable oils cannot be used on account of their irritating quality, castor oil being one of the few contra-indicated. Liquid petrolatum may be used freely as a diluent, especially when a large quantity of contrast medium is required.

Examination of the urine after bronchography and salpingo-hysterography with lipiodol or iodipin reveals traces of iodine for many days.

For the purpose of simplifying the description of technic, the various parts of the body where the use of iodized oil is applicable will be divided into anatomical groups.

The nasal accessory sinuses.—The frontal, maxillary antra, and sphenoid sinuses may be injected. Pathologic processes, such as cysts, polyps, endostoses, and hypertrophic mucosa, usually stand out in bold relief. Iodized oil may be used as prepared commercially, although Fraser (5) recommends petrolatum as a menstruum to increase the viscosity. The author endorses this practice.

Injection of the frontal sinus is made by inserting a cannula and forcing from 1 to 5 c.c. of the oil, depending upon the size of the locules. The cannula with a valve arrangement is retained in the ostium to prevent the leakage of the contrast medium.

Injection of the oil in the maxillary antra can be accomplished only after puncture through the inferior meatus. The cannula may be left *in situ* during the X-ray exposure, but if the viscosity of the fluid is increased sufficiently, it may be withdrawn.

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[1] From the X-ray Department of Bellevue Hospital. Read in part before the Yorkville Medical Society, May, 1927.

[2] Exposure to air discolors the compound owing to the liberation of necent iodine.

[3] The belief that these compounds are sterile or antiseptic has been proven to be untrue by Archibald and Brown (4). Those writers have demonstrated that the 40 per cent oil does not have marked bactericidal or bacteriostatic properties.

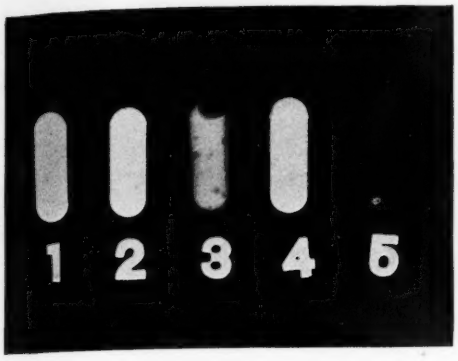


Fig. 1. Relative radiopacity of contrasting media: 1. Lipiodol; 2. Iodipin; 3. Lipiodol 40 per cent in petrolatum; 4. Beck's paste; 5. Sodium iodide solution 10 per cent.

The head is placed in a slightly oblique Waters position on a 20° inclined board, with the patient sitting, thereby bringing the natural ostium at its highest level.

The sphenoid sinuses can, of course, be injected only after puncture.

Injection of the lachrymal sac and duct has been reported by Van der Hoeve and Steenhuis (6). The injection is done with an ordinary lachrymal syringe subsequent to emptying of the sac and ducts. Stenosis and other pathology can be readily visualized.

The eustachian tube.—The author's description of the technic to visualize this important canal is incorporated in an article by Dr. William Spielberg (7). Briefly, it may be described as follows: The patient is placed prone with the head turned on the side on a 15° inclined board. The pinna is pulled forward and the patient's head then rests on the mastoid process. A fine focus tube is used and a short cylindrical cone is adjusted to the tube stand. The tube is focused 1½ inches above the external ear, and exposure is made.

The bony portion is almost always seen, while the membranous segment can be visualized only upon injecting several drops of the oil through a eustachian catheter.

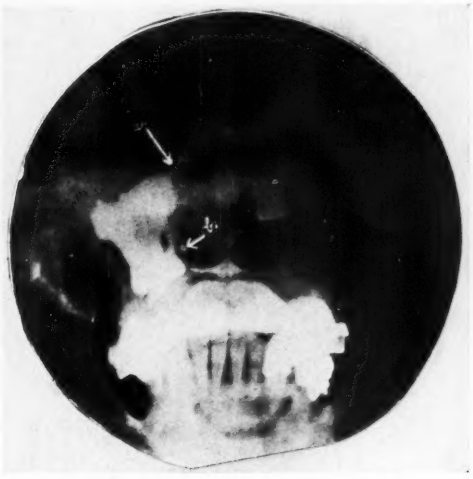


Fig. 2. Normal maxillary antrum injected with iodized oil. (*a*) Hiatus maxillaris; (*b*) Puncture through inferior meatus.

Respiratory tract.—It is in this part of the anatomy that the use of iodized oil has been epoch-making. A brief review of the normal morphology and roentgenologic appearance of the lungs will clarify certain obscure and hitherto vaguely explained conditions observed radiographically.

Marquis (8), in his experiments on dogs,

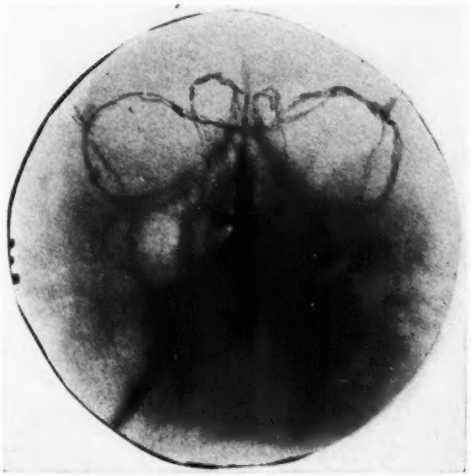


Fig. 3. Injected maxillary antrum revealing hypertrophic mucosa.

proved that the bronchial arborization did not produce the shadows radiating in all directions from the hilus, as observed on the roentgen plate of a normal chest.

waves of the bronchi, which were later described by Reinberg (9) in detail. The outstanding feature of his observation was that bronchiectasis diminishes the peristaltic ac-

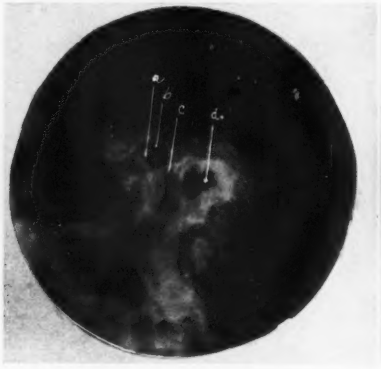


Fig. 4. Unusually well outlined eustachian tube. (*a*) Condyle of mandible; (*b*) Glenoid fossa; (*c*) Bony portion of tube; (*d*) Tympanum.

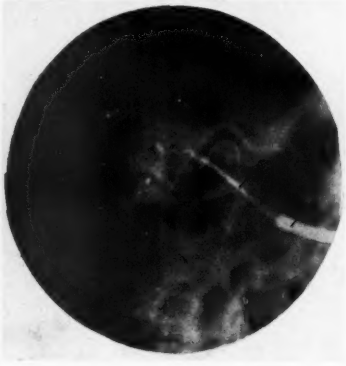


Fig. 5. Eustachian tube injected with iodipin. (*c*) Cannula in pharyngeal orifice of tube.

The trachea, for instance, with its thick cartilaginous rings, cannot be silhouetted upon a film—much less to be expected are the bronchi. The exsanguinated lung produces practically no pulmonic markings; on filling the blood vessels with water, these reappear. This condition holds true in bronchiectasis to a great degree. Small dilatations and cavitations are usually overlooked unless they contain some retaining secretions, when even the smaller bronchioles may be visualized.

The author's work in pneumography was done on rabbits in the early part of 1925, when the use of iodized oils in the human was looked upon skeptically on this continent. Our experience with these animals taught us many things, chief among which was that the volume of oil to be injected should be kept at a minimum.

Careful inspection of the injected bronchi in animals as well as humans revealed various forms of contractions or peristaltic

tivity, while gangrene or abscess increases it.

There are several methods recommended for the introduction of iodized oil into the bronchi. A brief review of these, with comments on their relative value as observed by the author and other investigators, should be relevant at this time.

(A) *Supraglottic:* This procedure requires the introduction of a laryngeal cannula just beyond the base of the tongue, the warm oil to be dropped slowly through the glottis. The pharynx usually requires spraying with a 10 per cent cocaine solution, and about 1 c.c. of the same solution is injected into the trachea. The body is inclined to the side to which it is desired that the oil shall gravitate.

(B) *Transglottic:* In this method, a rubber tube, simple cannula, or Iglauer's (10) double-barrelled intubation cannula is introduced into the trachea after proper preparation and cocainization. The latter

device is described as a double-barrelled tube, one permitting the injection of the oily substance, while the patient breathes through the other barrel.

unhindered use of the fluoroscope during the filling of the bronchi.

Technic: The patient lies recumbent on the horizontal fluoroscopic table. A hypo

Fig. 6. Rabbit, showing lungs injected with an excessive amount of iodized oil. Notice loss of detail.

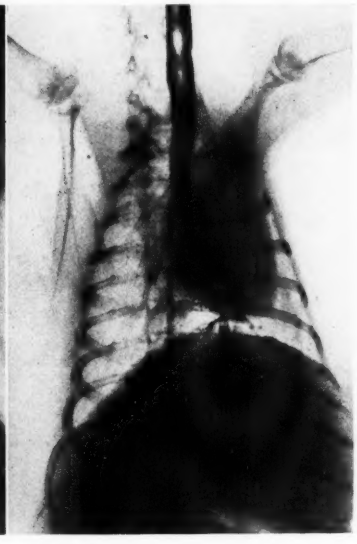


Fig. 7. Rabbit, showing detailed outline of the left bronchus on injecting a small amount of contrast medium.

(C) *Subglottic or transcricothyroid membrane:* This method is one of two recommended by Forestier (11) for routine work and has been found to be quite simple and exact in results by the author and others (12, 13). The only difficulty encountered was with the use of Forestier's cannula, on account of its curve and extremely small lumen.

The author devised a straight cannula of a No. 14 gauge, 18 to 21 mm. in length. The length of the cannula was decided on after measuring the antero-posterior intralaryngeal diameter at the level of the cricothyroid membrane in several cadavers. This was found to vary between 28 and 32 mm. The angulated joint (see Fig. 8) is another important modification which permits the

of morphine sulphate gr. ¼ and atropine sulphate gr. 1/150 is given. The skin over the cricothyroid membrane is anesthetized with a 2 per cent novocain solution. The cannula described above is then introduced and the trocar removed; if the trachea has been entered, breath sounds will be heard. This precaution must be observed to eliminate the danger of infiltrating the peritracheal tissues. A 2 c.c. syringe is then filled with a 1 per cent warm cocaine solution, adjusted to the cannula, and the solution slowly injected. It is inadvisable to use a hypodermic needle of small caliber for this purpose because of the danger of it breaking and being inhaled. The author has had this experience, with the fortunate exception that the needle was caught while still in the

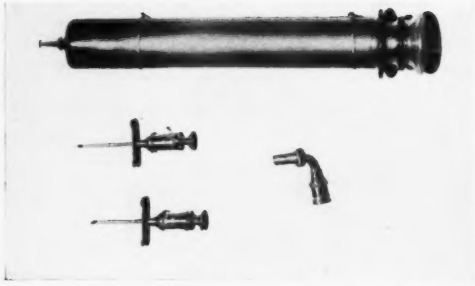


Fig. 8. Bronchography cannula, angle, and 20 c.c. syringe.

cricothyroid membrane and was readily extracted.

A 20 c.c. syringe is then filled with the iodized oil, previously warmed in a water bath to 38° C. The patient is gently inclined to the side one wishes to explore and from 10 to 20 c.c. of the oil is injected. The instrument is then withdrawn and radiographs made in the antero-posterior and oblique positions.

In spite of the anesthesia induced, the cough reflex returns very soon, so that most of the contrast medium is expectorated.

Fig. 9. Bronchiectasis. Note saccular dilatation at left base. Bronchography by supraglottic method.

Fig. 10. Bronchiectasis, right lung. Note the oil entirely confined to affected side. Subglottic method.

(D) *Bronchoscopic method:* The use of the bronchoscope or Mandelbaum's (14) bronchial catheter and guide rather circumvents more simple methods for exploration of the bronchial tree. There are, nevertheless, occasional indications for their use.

A few words may finally be said of the dangers of pneumography. Archibald and Brown (4), by citing several fatal cases, deprecate the promiscuous use of this method of pulmonary exploration, and rightly so. On the other hand, out of the vast literature containing the reports of several thousand injections, untoward effects directly attributable to the iodized oil have been observed only rarely.

The reno-genital tract.—This part of the anatomy includes the seminal vesicles, the bladder, ureters, and renal pelvis; in the female, the uterus and adnexa. Forestier (11) reports excellent results with lipiodol in the visualization of the seminal vesicles, while other investigators (15) have found the iodized vegetable oils harmful by reason of their slow absorption and elimination causing irritation and cicatricial formation. They recommend, instead, an 18 per cent solution of iodine in cod liver oil or a 12

per cent mixture of thymol iodide in the same oil.

Although Neuswanger (16) speaks highly of iodized oil in pyelography, Forestier (11) states: "We have encountered difficulties in the examination of the kidney pelvis and of the ureter." The author's experiences with this medium in pyelography have not been encouraging for the following reasons: It requires a pressure equivalent to several hundred millimeters of mercury to propel the oil through the small lumen of the catheter. Secondly, the oil accumulates in the form of droplets within the renal pelvis. Dilutions of mineral oil with lipiodol or iodipin were tried with the same results. Vesical roentgenography was found to be very satisfactory. The enormous amount of oil necessary for this examination, even though diluted, made the cost of the medium almost prohibitive.

The use of iodized oil in the uterus and adnexa as a complement to the Rubin test or even without the latter method has created enormous possibilities for studying the normal physiological reactions, as well as detecting many pathological conditions previously visible only on the operating table.

The presence of vaginal and fallopian tube peristalsis was heretofore only conjectured, but this is now definitely demonstrated after oil injection. The bicornuate uterus, defects produced by uterine tumors and disease, the stenotic tubes or the obliterated proximal or distal ostium can be readily visualized.

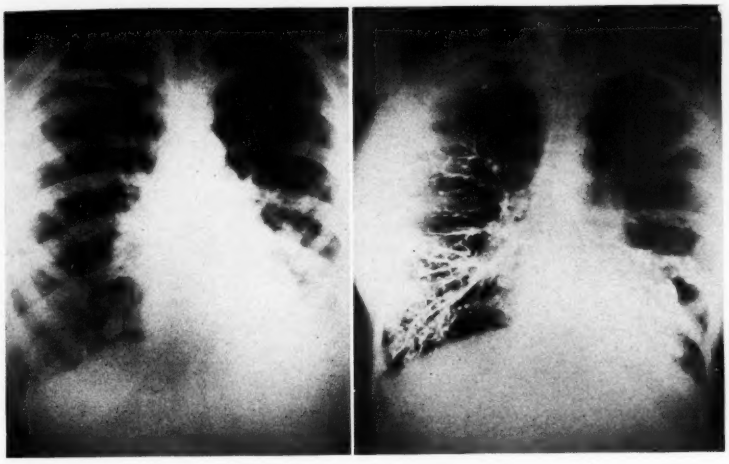


Fig. 11-*A*. Before bronchography. Note infiltrations of lower lobes.

Fig. 11-*B*. Bronchography, transcricothyroid membrane. Note fusiform dilatation of bronchi behind the heart.

Although pregnancy can, as a rule, be diagnosed by other means, there are a number of conditions that might perplex the most observant gynecologist. The author, as well as other observers, has not encountered ill effects from this method of exploration.

Tubal pregnancy (17) is described as presenting a characteristic picture of atony of the uterus and occlusion of one tube, resulting in a trumpet-shaped filling defect.

Technic: The instruments required are as follows: An Ultzmann cannula with a tight fitting rubber tip adjusted about 4 cm. from the terminal portion; the arc of the distal end somewhat reduced. A 10 c.c.

Luer syringe, bivalve speculum, a tenaculum, and sponge forceps.

The patient, after a thorough bowel cleansing, is placed in the horizontal fluoroscopic table, the speculum inserted, the cervix swabbed with iodine, and the upper lip grasped with the tenaculum. The cannula, with the syringe attached, is then inserted into the cervical canal and moderate pressure made to prevent the escape of oil. The fluoroscopic screen is then brought into position and the injection begun. Between 4 and 6 c.c. suffices as a rule. As soon as the uterus is filled to capacity and the tubes only partially, the injection is stopped, and

Fig. 12-*A*. Lung abscess, lower lobe of right lung. Thoracotomy.

Fig. 12-*B*. Bronchography reveals tracheobronchial fistula.

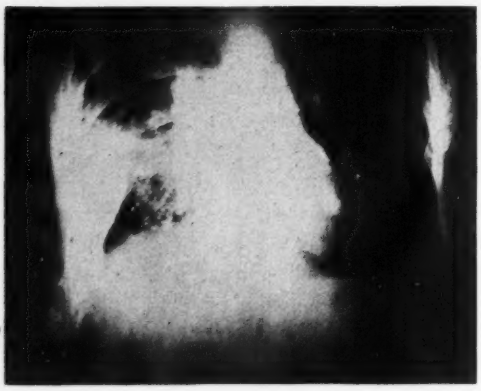


Fig. 13. Empyema necessitatis. Note pus pocket within dotted area, not seen before oil injection.

Fig. 14. Pyonephrotic kidney. Note peculiar globular collection of the iodized oil.

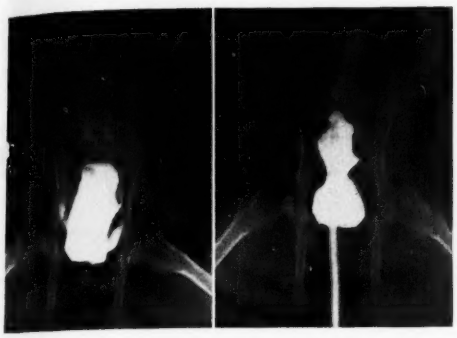


Fig. 15-*A*. Injected vagina in a rabbit.

Fig. 15-*B*. Radiograph taken several minutes later than Figure 15-*A* reveals peristalsis radiating from without inward.

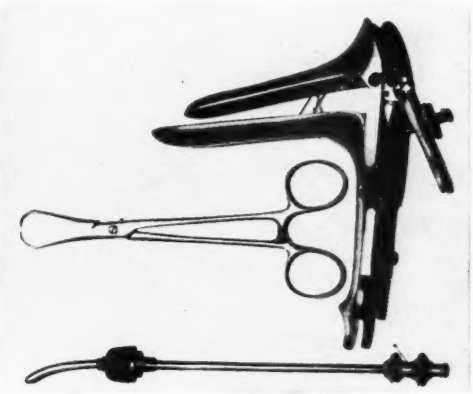


Fig. 16. Salpingohysterography instruments.

radiographs made several minutes apart. As a rule, the tubes appear completely filled on the second radiograph. Occasionally no oil will be seen in the tubes on the day of the injection. Radiographs made two or three days later will invariably show the tubes filled, and some of the medium will be seen in the pelvic cavity if the fimbriated end is patent. This process is, in the author's opinion, the result of a negative intra-abdominal pressure, and has been observed in several patients.

Béclère (18) controls the injections by a manometer and never exceeds a 30 cm. pressure. With a pressure of 40 cm. of mercury, the oil may be forced into the blood vessels.

To further enhance the visibility of adnexal pathology such as tumors, cysts, etc., Stein and Arens (19) demonstrated the advantage of a pneumoperitoneum combined with the oil injection.

Central nervous system.—There is some diversity of opinion as to the popularization

Fig. 17-*A*. Salpingohysterogram suggesting occlusion of fallopian tubes.

Fig. 17-*B*. Same patient radiographed three days later, revealing iodized oil in pelvic cavity and tubes.

Fig. 18-*A*. Injected uterus and tubes. Right tube is patent.

of the iodized oil injection in the examination of the spinal canal and brain ventricles.

Maclaire (20), Temple Fay (21), and Schmidt (22) found the substance as a rule extremely irritating, so that its use should be limited to patients in whom a laminectomy will be done. Sharpe and Peterson (23) report that the presence of iodized oil in the spinal theca has a tendency to aggravate clinical symptoms, necessitating in one case the removal of the oil by laminectomy. Abelheim (24) used iodipin containing only 20 per cent of iodine in sesame oil and found it less irritating. Wolfsohn and Morrissey (25), however, found the injection of lipiodol intrathecally to be innocuous.

Technic: The recognized procedure is as follows: The patient is in an upright position, head bent forward. The operator inserts a lumbar puncture needle to a depth of 4 cm. between the occiput and atlas into the cisterna magna. About 1 or 2 c.c. of the oil is injected intrathecally, and radiographs are made in the sitting position, after one, six, and twenty-four hours. Robineau (26) injects above and below the suspected site of obstruction, and considers this method diagnostically infallible and quite harmless.

At times, some delay is observed at the level of the fourth dorsal vertebra—anatomically the narrowest portion of the spinal canal. In the absence of any obstruction, the oil gravitates readily to the lumbar cul-de-sac.

Blood vessel visualization was attempted by Forestier (27) by injecting into the veins, but he found it impractical. Recently, Carnett and Greenbaum (28) have succeeded in visualizing the tibial and pedal arteries by injecting about 6 c.c. of iodized oil in the femoral artery.

Other uses.—The value of injections of iodized oils in fistulous tracts and other obscure discharging sinuses may be gleaned

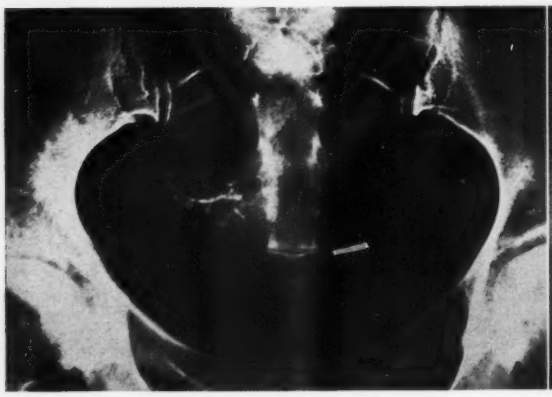


Fig. 18-*B*. Same patient as in Figure 18-*A*, showing almost complete disappearance of the oil seven weeks after examination.

Fig. 19. Occlusion of tubes at uterine ostium. Note rounded cornua (very characteristic).

from the accompanying figures, with their legends.

The technic for this work is variable. At times, a catheter is inserted, while in other cases an ordinary urethral syringe with a rubber nozzle is used and held against the sinus opening to prevent the escape of fluid. Radiographs should be made in two positions so that three dimensions of the injected area may be seen. When feasible, stereoscopic views should be made to accurately determine the size, location, and course of the sinus tract or cavity.

Therapeutics: Forestier (11) has reported the therapeutic value of lipiodol in patients suffering from chronic suppuration of the respiratory tract.

Bruce Whyte (29) has noticed decided improvement in thirteen patients with bronchiectasis. His practice is to inject from 5 to 20 c.c. of oil by the supraglottic method, at intervals of from five to fourteen days.

Fig. 20. Occlusion of tubes at the fimbriated end. Rubin test negative to 150 mm.

Fig. 21. Extremely obese patient. Pregnant uterus, about nine weeks.

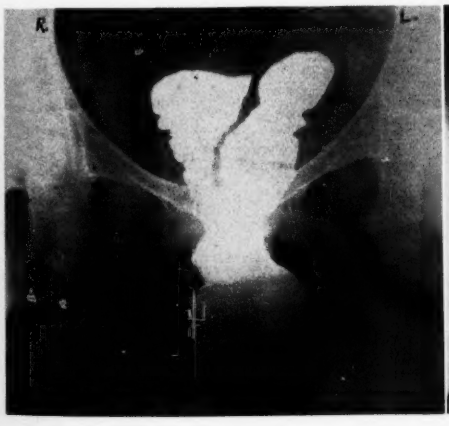


Fig. 22-*A*. Didelphic patient, age 26, nullipara. Vagina injected with oil, revealing septum.

Fig. 22-*B*. Same patient as in Figure 22-*A*, showing injected right uterus and tube. Left cervix rudimentary.

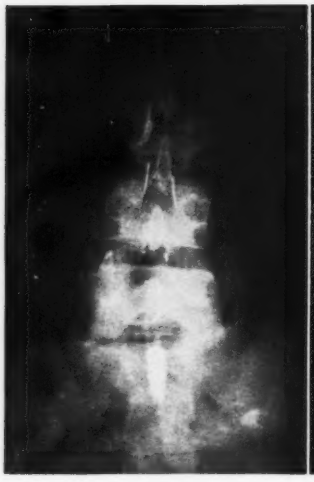


Fig. 23-*A*. Injected spinal canal—found normal. Bullet-shaped precipitate characteristic.

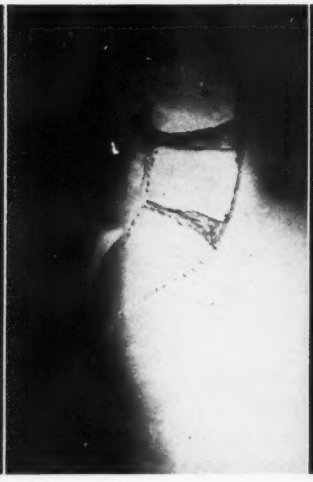


Fig. 23-*B*. Same patient as in Figure 23-*A*, lateral view of lumbar spine. Note triangular collection of the oil.

Fig. 24. Intrathecal injection reveals obstruction at the level of the body of the fifth lumbar. Verified by operation.

Belfield and Rolnick (15) are employing an iodized oil in the treatment of seminal vesiculitis.

Fig. 25. Showing course of discharging sinus of 7 years' duration. Notice destructive spondylitis at the junction of the fourth and fifth lumbar vertebræ.

CONCLUSIONS

1. Injections of iodized oil are innocuous in the nasal accessory sinuses, eustachian tubes, and the lachrymal ducts.

2. Exploration of the bronchial tree is comparatively harmless, but cases must be selected. It is contra-indicated in tuberculosis and hyperthyroidism.

3. Injection of iodized oil in the renal tract is inexpedient. Better results may be had by injecting sodium iodide solution. In exploration of the uterus for pathology, the results are infallible and harmless.

4. Meningeal exploration must be made with caution.

Iodized oil, whether used as lipiodol or iodipin, in commercial strength or diluted, is an excellent opaque medium in roentgenology.

REFERENCES

(1) Sicard, J. A., and Forestier, J.: General Methods of Radiological Exploration with Iodized Oil. Bull. et mém. Soc. méd. d. hôp. de Paris, March 17, 1922, XLVI, 463.

(2) Putnam, Tracy J.: Some Brominized Oils for Radiographic Use. Jour. Am. Med. Assn., Oct. 2, 1926, LXXXVII, 1102.

(3) BINET, L., and VERNE, J.: Quoted by Putnam, above.
(4) ARCHIBALD, E., and BROWN, A. L.: Dangers of Introducing Iodized Oil into Tracheobronchial System. Jour. Am. Med. Assn., April 23, 1927, LXXXVIII, 1310.

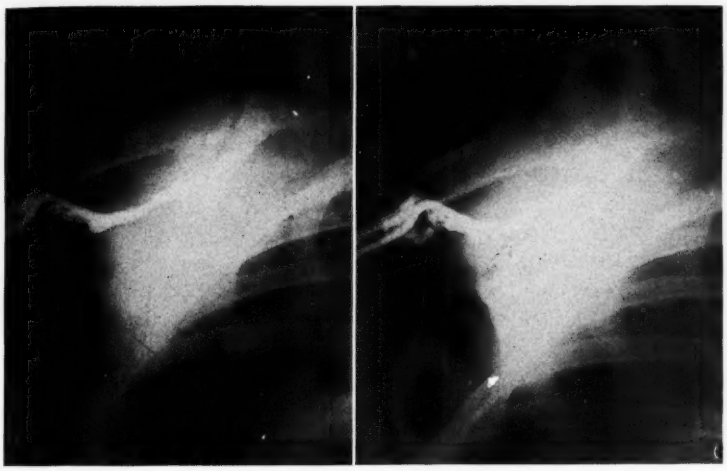


Fig. 26. Injected sinus tract in axilla, showing destruction of glenoid fossa (stereoscopic).

(5) FRASER, R. H.: Iodized Oil (Lipiodol) in Otolaryngologic Diagnosis—Opaque Injection Study of 35 Maxillary Sinuses. Jour. Mich. St. Med. Soc., June, 1926, XXV, 270.
(6) VAN DER HOEVE, J., and STEENHUIS, D. J.: Roentgenograms of Tear Ducts after Filling with Lipiodol. Klin. Monatsbl. f. Augenh., May-June, 1925, pp. 671-681.
(7) SPIELBERG, WILLIAM: Visualization of Eustachian Tube by Roentgen Ray: Preliminary Report. Arch. Otolaryngol., April, 1927, V, 334.
(8) MARQUIS, W. J.: Experimental Study of Markings Seen in Roentgenograms of Lungs of Normal Dogs. Am. Jour. Roentgenol. and Rad. Ther., September, 1925, XIV, 247.
(9) REINBERG, S. A.: Roentgen-ray Studies on Physiology and Pathology of Tracheobronchial Tree. Am. Jour. Roentgenol. and Rad. Ther., October, 1925, XIV, 354.
(10) IGLAUER, SAMUEL: Use of Injected Iodized Oil in Roentgen-ray Diagnosis of Laryngeal, Tracheal, and Bronchopulmonary Conditions. Jour. Am. Med. Assn., June 19, 1926, LXXXVI, 1879.
(11) FORESTIER, J.: Iodized Oil (Lipiodol) in Roentgenology. Am. Jour. Roentgenol. and Rad. Ther., April, 1926, XV, 352.
(12) LANDAU, WALTER: Intratracheal Use of Iodipin for Roentgen Diagnosis of Respiratory Organs. Klin. Wchnschr., Sept. 24, 1925, p. 1861.
(13) GUY, J., and ELDER, H. C.: Preliminary Report on Radiographic Exploration of Bronchopulmonary System by Means of Lipiodol. Edinburgh Med. Jour., May, 1926, n.s. XXXIII, 269.
(14) MANDELBAUM, J. M.: Demonstration at Bellevue Hospital, New York, 1926.
(15) BELFIELD, W. T., and ROLNICK, H. C.: Roentgenography and Therapy with Iodized Oils. Jour. Am. Med. Assn., June 12, 1926, LXXXVI, 1831.
(16) NEUSWANGER, C. H.: Iodized Oil as Pyelographic Medium. Surg., Gynec. and Obst., August, 1926, XLIII, 169.
(17) SCHNEIDER, P., and EISLER, F.: Roentgen Diagnosis of Tubal Pregnancy. Zentralbl. f. Gynäk., May 28, 1927, LI, 1360.
(18) BECLERE, C.: Pressure in Intra-uterine Injection of Iodized Oil. Gynéc. et Obst., Paris, August, 1926, XIV, 105.
(19) STEIN, I. F., and ARENS, R. A.: Iodized Oil and Pneumoperitoneum Combined in Gynecologic Diagnosis: Preliminary Report. Jour. Am. Med. Assn., Oct. 16, 1926, LXXXVII, 1299.
(20) MACLAIRE, A. S.: Lipiodol in Neurosurgery. Am. Jour. Med. Sci., December, 1925, CLXX, 874.
(21) FAY, TEMPLE: Diagnostic Value and Interpretation of Cerebro-spinal Determinations. Ann. Surg., November, 1924, LXXX, 641.
(22) SCHMIDT, E. A.: Use of Iodized Oil, Lipiodol, and Iodipin in Roentgen-ray Diagnosis of Spinal Lesions. Am. Jour. Roentgenol. and Rad. Ther., May, 1926, XV, 431.
(23) SHARPE, W., and PETERSON, C. A.: Dangers in Use of Lipiodol in Diagnosis of Obstructive Lesions of Spinal Canal. Jour. Bone and Joint Surg., April, 1926, VIII, 348.
(24) ABELHEIM, A.: Notices on Tumor of Spinal Cord Located by X-ray Examination. South

African Med. Record, March 28, 1925, XXIII, 127.
(25) WOLFSOHN, J. M., and MORRISSEY, E. J.: Tumors of Cauda Equina: Report of Two Cases. Jour. Am. Med. Assn., June 12, 1926, LXXXVI, 1828.
(26) ROBINEAU: Lipiodol in Diagnosis of Spinal Tumors. Presse Méd., May 18, 1927, p. 630.
(27) FORESTIER, J.: Iodized Oil in Radiologic Practice. Paris Méd., April 26, 1924, p. 377.
(28) CARNETT, J. B., and GREENBAUM, S. S.: Blood Vessel Visualization. Jour. Am. Med. Assn., Dec. 10, 1927, LXXXIX, p. 2039.
(29) WHYTE, BRUCE: Iodized Oil with Reference to Bronchiectasis. Can. Med. Assn. Jour., December, 1926, XVI, 1443.

The Roentgenogram in Mastoid Disease. Henry K. Taylor. Am. Jour. Roentgenol. and Rad. Ther., June, 1928, XIX, 522.

The value of mastoid roentgenograms consists in the obtaining of information concerning the anatomical make-up of the mastoid process under consideration plus its pathologic variations. The mastoid antrum can be readily identified on the film as that area which lies supero-posterior to the auditory canal. This is an important area for study since the first changes of an acute mastoiditis manifest themselves in this region. In the normal mastoid the lateral sinus is only faintly seen, the mastoid cells and blood content of the sinus being of about the same density, but with pathologic changes in the cells the sinus wall frequently appears quite prominent.

Pathologic changes occurring in the mastoid, and demonstrable on the film, consist of variations in density, absorption of bony trabeculæ, and erosions of the tegmen or sinus wall. The first change may be due to an acute mastoiditis, an acute purulent otitis media, or to any inflammatory process overlying the mastoid cell area, whereas the second manifestation of bone destruction can be due only to pathology within the mastoid process. Occasionally it will be possible to recognize perisinal or epidural abscess by visualizing a solution of continuity of the sinus wall or tegmen.

J. E. HABBE, M.D.

RADIATION EFFECTS ON SYSTEMIC ALEUKEMIC LYMPHOMATOSIS

A REPORT OF FOUR CASES

By BERNARD F. SCHREINER, M.D., F.A.C.S.

State Institute for the Study of Malignant Disease, Buffalo, N. Y.,
Burton T. Simpson, M.D., Director

A SURVEY of the records of the State Institute for the Study of Malignant Disease shows 24 cases of chronic lymphatic leukemia, 19 cases of myelogenous leukemia, 66 cases of Hodgkin's disease, and 102 cases of lymphosarcoma which have been reported in previous papers. Besides these, there have occurred four other cases with lymphatic enlargements, one of the superficial lymph nodes, two presenting disseminated tumor masses in the abdomen, and one with involvement of all the superficial lymphatics as well as of the tonsils, abdominal lymph nodes, and the spleen. These four cases have been of especial interest to me from the standpoint of diagnosis, which at first was somewhat perplexing. However, a careful investigation showed them to be cases of what has been classified by Ewing, Cohnheim and other observers (1) as true pseudoleukemia. Cases of this kind, while not absolutely rare, are sufficiently infrequent to warrant a detailed discussion and the reporting of the individual case records.

It has long been recognized by clinicians and pathologists that the term "pseudoleukemia" has been applied with extreme looseness, being used frequently to describe any general enlargement of the lymphatic nodes throughout the body other than those with marked leukocytosis of the lymphatic or myelogenous type. Tuberculosis, Hodgkin's disease, and chronic systemic diseases are known to cause a lymphadenitis which may be construed as a pseudoleukemia from the interpretation of the blood pictures. It is acknowledged by competent observers (Cohnheim, Ewing, Wunderlich, Pinkus, and Ehrich)[1] that the term "pseudoleukemia" is misleading as applied in general. True pseudoleukemia, or, as Ewing calls it, "systemic aleukemic lymphomatosis," should be separated from the others because it is a clear-cut clinical entity.

Wunderlich, as quoted by Ewing in his book *Neoplastic Diseases,* describes true pseudoleukemia as being "a peculiar disease which is chiefly characterized by a gradual development of very numerous and sometimes very large swellings of superficial and internal lymph nodes, and by peculiar deposits in the internal organs, especially in the spleen, also in the liver, less often in the kidneys, gastro-intestinal lymphatic system, lungs, pharynx and elsewhere." Ewing goes on to say: "Uniform microscopical distinctions between the pseudoleukemic and the leukemic process have not been demonstrated. There is the same obliteration of sinuses and follicles, the respect for capsules, the wide diffusion of the process, the tendency to fibrosis, and the exclusive participation of lymphocytes, as in leukemia. Baumgarten found that the leukemic nodes permit the passage of injection fluids, while the pseudoleukemic do not."

The blood pictures in these four cases showed a normal, or slightly lower or slightly increased total, leukocyte count, with an absolute lymphocytosis differentiating these cases from the leukemias and the lymphogranulomas.

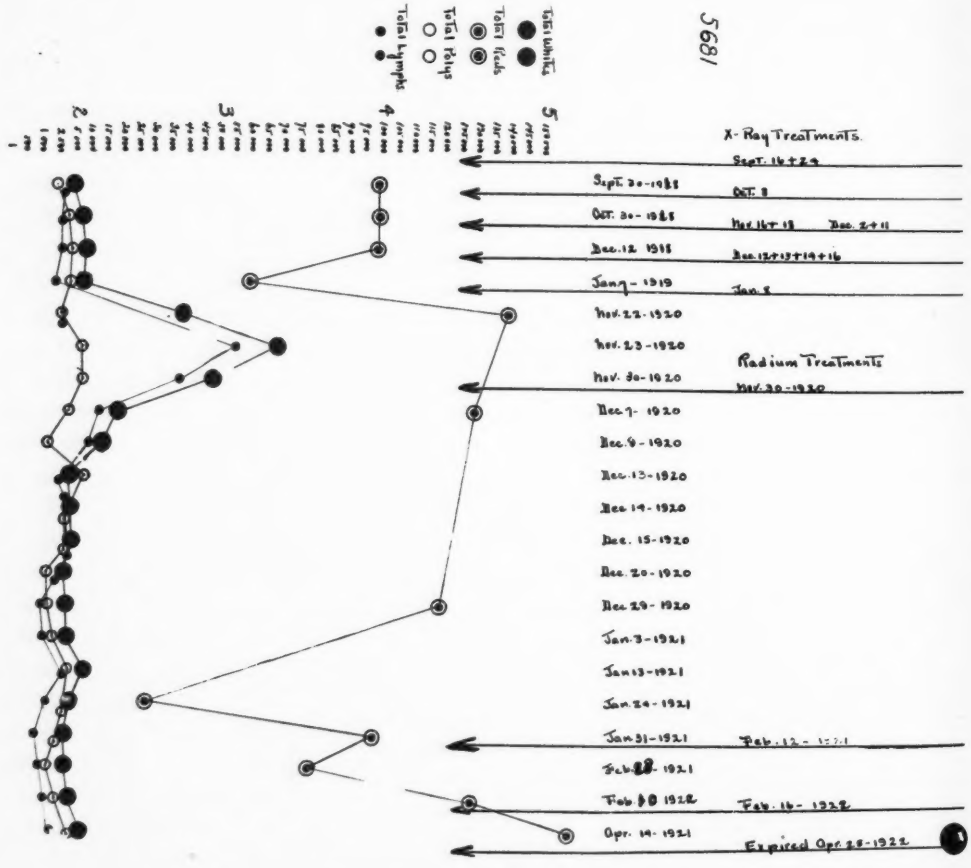
CASE REPORTS

Case No. 5681, Mrs. B., admitted Sept. 17, 1918; occupation, housewife. *Com-*

[1] Ewing's book gives complete list of references.

plaint: Pain in back, swollen abdomen, and weakness. *Family history* was negative. *Past history:* No serious illness except scarlet fever when a child. Married 22 years; no children. *Menstrual history:* Normal, menopause when 41. No history of injury. *Present illness:* Began one year before admission, when she complained of pain in back, began to feel weak, and the abdomen became enlarged. She also had a slight yellowish discharge from the vagina. Diagnosis of tuberculous peritonitis was made and she received heliotherapy for six months with no improvement.

Examination on entrance revealed a well nourished woman, with the skin of the body tanned by heliotherapy, who presented two small palpable nodes in the right side of the neck, anterior to the sternocleidomastoid muscle. *Examination of abdomen:* Liver and spleen were enlarged. There was a large tumor mass in the abdomen, the size of a six months' pregnancy, and a scar in the midline from the umbilicus to the symphysis from recent operation, when section had been removed from a retroperitoneal mass. Histologically this had been diagnosed round cell sarcoma. The blood Wassermann and Kahn test were negative; urinalysis was negative. *Blood examination*



Blood Chart 1 (of Case No. 5681).

showed: Hemoglobin 80 per cent; red blood cells 4,002,000; leukocytes 6,000; basophiles 2 per cent; polymorphonuclears 36 per cent; lymphocytes 54 per cent; mononuclears 8 per cent. Repeated blood examinations are depicted in Chart 1.

The patient received X-ray treatment over the abdominal tumor mass at intervals for a period of four months. There was a gradual disappearance of the tumor mass in the abdomen. Meanwhile a chylous ascites appeared which was aspirated on two occasions; this ascites did not recur after the second tapping. From January, 1919, she was clinically well for a period of almost two years, but returned in November, 1920, with enlargement of the lymph nodes in both sides of the neck and both axillæ and a tumor mass palpable in the abdomen. The liver and spleen were also enlarged. At this time the blood count was: Hemoglobin 90 per cent; red blood cells 4,800,000; leukocytes 40,000; polymorphonuclears 9 per cent; small lymphocytes 86 per cent; large lymphocytes 5 per cent. Radiation, by radium packs, again caused the disappearance of this tumor mass and the enlarged nodes. In January, 1921, the spleen was still palpable.

Following this, the patient failed to return for observation until February, 1922, at which time she came in with extreme nervous symptoms, twitching of the muscles of the neck, especially the right trapezius muscle. The right pupil was larger than the left but reacted sluggishly to light; accommodation was normal. There was pain and tenderness in the back of the neck, cervical and upper dorsal spine. No tumor masses were found anywhere. Her blood count at this time was: Hemoglobin 93.3 per cent; red blood cells 4,672,000; leukocytes 7,200; basophiles 1 per cent; myelocytes 2 per cent; polymorphonuclears 66 per cent; small lymphocytes 23 per cent; large lymphocytes 4 per cent; mononuclears 4 per cent. She became emaciated, the nervous symptoms progressed, and she died on April 25, 1922.

Autopsy showed an emaciated body with bronchopneumonic areas in both lungs. The

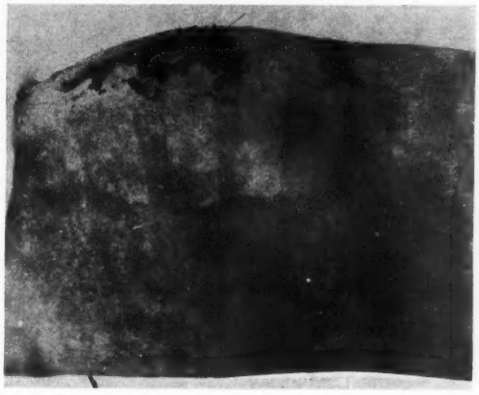


Fig. 1. Case No. 5681, taken September 27, 1918.

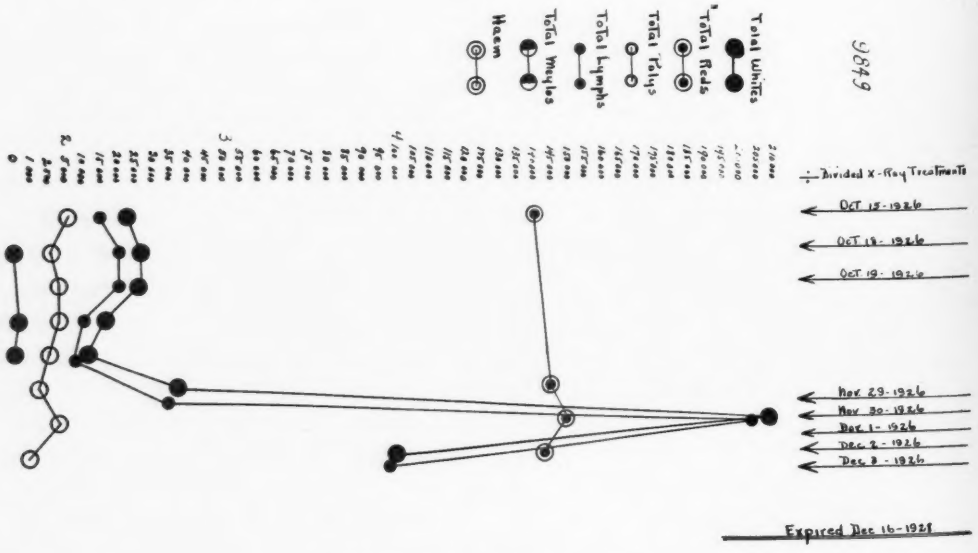
heart showed slight evidence of an old pericarditis; the heart muscle was normal except for slight hypertrophy. *Abdomen:* The whole gastro-intestinal tract was apparently normal. Liver was normal in size and color, histologically normal. Spleen impressed one as being larger than normal; histologically there was nothing remarkable except a great deal of pigment. The connective tissue around the aorta and inferior vena cava seemed more thickened than usual. There were no enlarged nodes. The pelvic organs were atrophic. *Examination of the head* showed a pachymeningitis with an excess of cerebro-spinal fluid; the right hemisphere was apparently larger than the left. No tumor deposits were found. *Anatomical diagnosis* of old pericarditis, bronchopneumonia, hypertrophy of the spleen, and chronic pachymeningitis was made.

This case was of interest because at the time of admission histological diagnosis of retroperitoneal round cell sarcoma had been made and would have stood were it not for the low leukocyte count of 6,000, with an

absolute lymphocytosis of 54 per cent. Almost two years later the blood findings were those approaching a chronic lymphatic leukemia—leukocyte counts of 40,000 to 68,000, with an absolute lymphocytosis of 84 per cent. Following treatment by radiation the blood count returned to approximately normal. Death occurred about three and one-half years after first admission. Autopsy failed to reveal any of the pathological findings of a leukemia.

Case No. 9849, Mr. L., age 51, occupation, laborer. *Complaint* was of pain in the chest, abdomen, and back, and of indigestion. *Family history:* Negative. *Marital history:* Married 22 years; wife and one son alive and well; no other children. *Past illnesses:* Mumps and diphtheria when a child. Habits were good. Denied venereal disease. No injuries. *Present illness:* Dated back one month, when he began to have pain in the chest, abdomen, and back, and sour stomach, with considerable gas and constipation. He complained of weakness and was unable to pursue his work. At this time he had noticed a lump under the right arm. This lump had been removed and histological diagnosis of lymphoma had been made. During the course of a few weeks other lumps had appeared under the right arm.

Examination on Oct. 15, 1926, showed that there were distinct palpable nodes in both sides of the neck, both axillæ, and both groins. The skin over the chest showed small shot-like bodies. The heart sounds were regular, but lacked muscle tone; there was roughening of the first sound. *Lungs:* Breath sounds throughout the chest on the right side were diminished; distinctly bronchial from the spine of the scapula down. Voice sounds were increased. There was egophony about the angle of the scapula. Breathing in the left chest was harsh, somewhat sonorous. X-ray examination showed the whole right chest to be practically obliterated with dense shadow; there was some fluid but also suggestion of solid tumor.



Blood Chart 2 (of Case No. 9849).

There was slight dislocation of the mediastinal shadow toward the left. *Abdomen:* The spleen was not palpable; the liver was enlarged. The urinalysis, blood Wassermann, and Kahn test were negative. The *blood examination* at this time showed: Hemoglobin 100 per cent; red blood cells 4,832,000; leukocytes 24,000; polymorphonuclears 26 per cent, and lymphocytes 74 per cent. A diagnosis of aleukemic leukemia was made. The subsequent blood counts are shown in Chart 2.

The patient was treated with high voltage X-rays over the left supraclavicular region, the right axilla, and the anterior mediastinum, 30 per cent of the skin dose being applied in the nodes. This treatment was followed by regression of the nodes in the neck and the axilla and of the nodules in the skin of the chest. In November he was seized with an attack of sore throat, followed by great enlargement of the nodes in the neck and the axillæ. The blood examination at this time showed: Hemoglobin 95 per cent; red blood cells 5,088,000; leukocytes 209,000; polymorphonuclears 2 per cent; lymphocytes 98 per cent. He received high voltage X-ray treatment again between November 29 and December 3, covering the axillæ, both sides of the neck, the groins, and a left epitrochlear node. He was permitted to go home, where he died on December 16. No autopsy was obtained.

This apparently was a case of chronic leukemia, showing, at the time of admission, an aleukemic blood picture.

Fig. 2. Case No. 11021, taken May 11, 1928, showing nodes in the neck.

Fig. 3. Case No. 11021, taken May 11, 1928, showing nodes in the breasts and under the arms.

Case No. 1391, Mr. McG., admitted November 16, 1927, 64 years of age; occupation, farmer. *Complaint on entrance* was

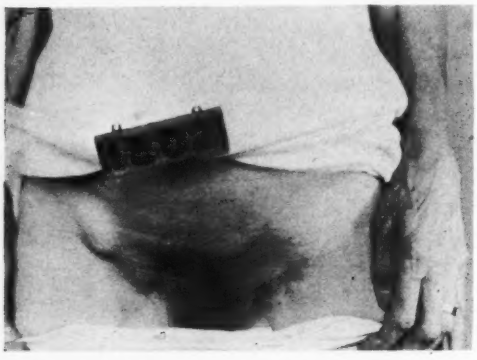
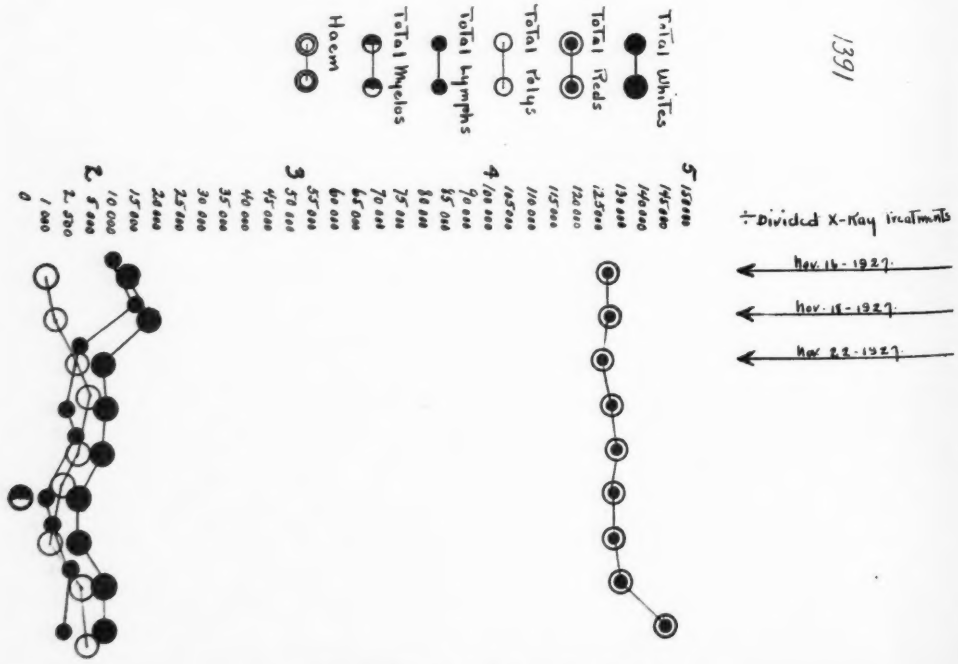


Fig. 4. Case No. 11021, taken May 11, 1928, showing nodes in the groins.

of weakness, shortness of breath, and pain in his legs. *Family history:* Father died at 57 of cancer of the lip; otherwise negative. *Marital history:* Married 26 years; wife and one son and five daughters alive and well; two children dead (ages 9, of diabetes, and 16, of heart trouble). *Past history:* No serious illness. Habits good. Injuries none. *Present illness:* For three months he had noticed that he tired easily, felt weak, and had pain and some swelling of the legs.

Examination at this time showed a poorly nourished, anemic man, weighing 143 pounds, who had enlargement of the lymphatic nodes in the neck, axillæ, and groins. *Chest* was normal. *Abdomen:* Liver and spleen were enlarged. There were numerous tumor masses felt in the abdomen which undoubtedly were mesenteric and retroperitoneal lymph nodes. The blood Wassermann and Kahn test and the urinalysis were negative. *Blood examination showed:* Hemoglobin 90 per cent; red blood cells 4,544,000; leukocytes 15,000; polymorphonuclears 8 per cent, and lympho-



Blood Chart 3 (of Case No. 1391).

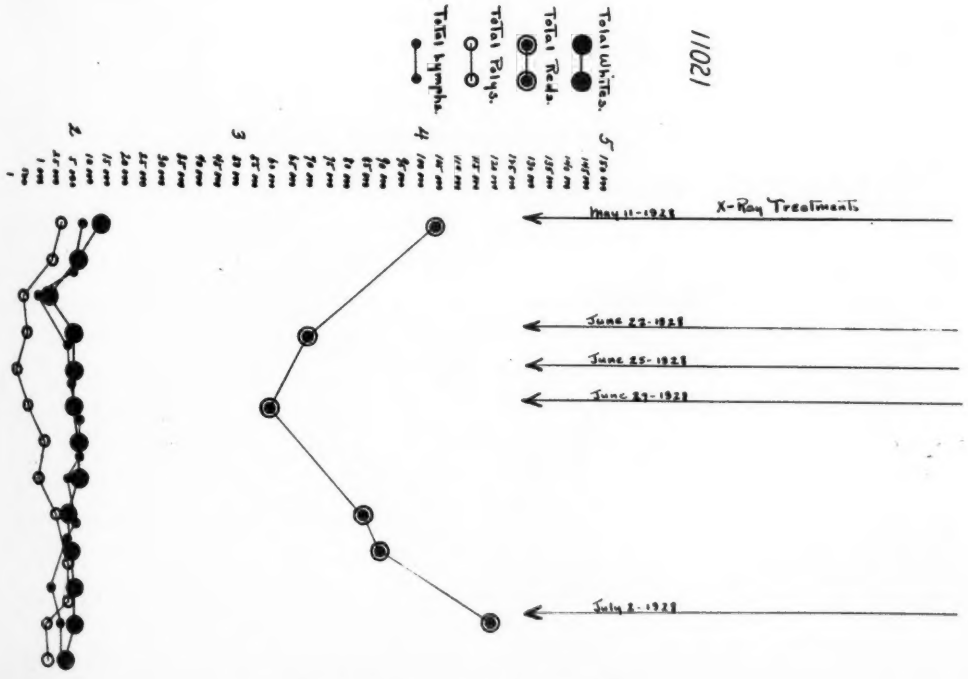
cytes 92 per cent. A diagnosis of aleukemic leukemia was made. Subsequent blood counts are shown in Chart 3.

He was treated, November 16 to 22, with high voltage X-rays over the abdomen and the back, a skin dose of 50 per cent being given over each area, which caused a gradual disappearance of the tumor masses in the abdomen in the course of six weeks. He was given arsenic medication also as a tonic. The spleen remained palpable, as did the nodes in the neck and axillæ. During the succeeding three to four months these nodes gradually disappeared and the spleen became smaller. Examinations in July and September, 1928, revealed no evidence of a recurrence of the enlargement of the nodes or of the spleen. Blood count of September 7, 1928, was: Hemoglobin 90 per cent; red blood count 4,736,000; leukocytes 13,500; basophiles 2 per cent; polymorphonuclears 73 per cent, and lymphocytes 25 per cent.

The results of radiation applied to the front of the abdomen and the back approximated a depth dose of 50 per cent of the skin erythema dose, given in three sittings between November 16 and 22. No other radiation was given. The enlargement of the lymph nodes in the neck and axillæ disappeared spontaneously.

Case No. 11021,[2] Miss A., admitted May 28, 1928, age 63 years: occupation, housework. *Complaint:* Enlargement of the glands in the neck, under the arms, and in the groins. *Family history* was negative. *Menstrual history:* Normal. *Past history:* Usual diseases of childhood; typhoid fever when 17. Indigestion over a period of three years. No injuries. Habits good.

[2]The number seen in the illustrations is for record, and does not correspond to the case number.



Blood Chart 4 (of Case No. 11021).

Present illness: Four years previous to admission the glands in the right neck began to swell; a little later those in the left neck also. She complained of pain in the neck at times. At the time of admittance there were also lumps under the arm, in the groins, on the left shoulder, and on the arms.

Examination at the time of entrance showed a slightly anemic woman with enlargement of the lymphatic glands in both sides of the neck, both axillæ, both groins, and in the epitrochlear regions. There were scattered nodules in the scalp, right arm, both wrists, and the skin of both breasts. The tonsils were markedly enlarged. The lymph nodes were firm and more or less matted. *Heart:* There was a systolic murmur at the apex. *Lungs:* There were areas of increased and decreased vocal and tactile fremitus. The X-ray examination of the chest showed marked thickening of the nodes at the right hilus. *Abdomen:* The spleen was markedly enlarged, extending downward to the crest of the ilium. The liver was palpable 5 cm. below the costal margin. The blood Wassermann and Kahn test and the urinalysis were negative. The blood count at this time was: Hemoglobin 80 per cent; red blood cells 4,196,000; leukocytes 14,000; eosinophiles 1 per cent; polymorphonuclears 28 per cent; lymphocytes 71 per cent. Subsequent blood counts are depicted in Chart 4.

This patient has been under observation from May 11 to September 12, 1928, during which time systematic blood counts have been made and X-ray treatments have been

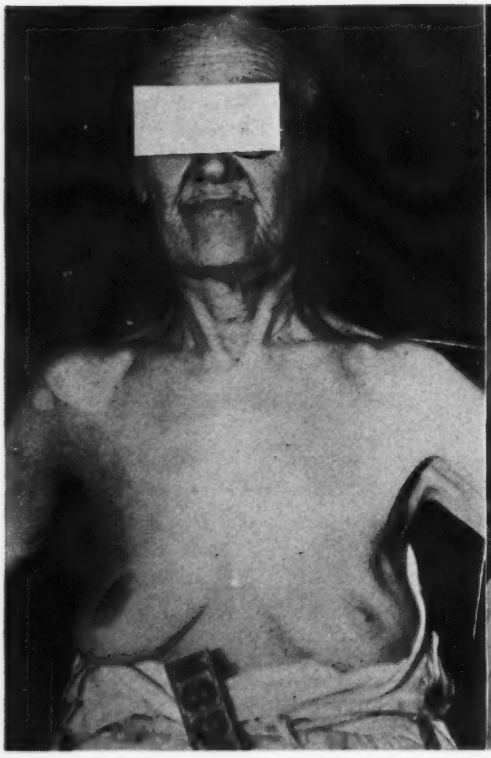


Fig. 5. Case No. 11021, taken July 3, 1928, showing diminution in nodes of the neck, breast, and axillæ.

Fig. 6. Case No. 11021, taken July 3, 1928, showing diminution in nodes of groins.

given as follows: May 11, the right and left groins and the right axilla received 70 per cent skin erythema dose (65 per cent tumor dose); June 22, the right and left neck received 30 per cent skin erythema dose (25 per cent tumor dose); June 28, left axilla received 30 per cent skin erythema dose (25 per cent tumor dose); July 2, 9, 10, the left groin, the right groin, and the left epitrochlear node were treated, respectively, each receiving 30 per cent skin erythema dose (25 per cent tumor dose); Sept. 10, the left neck and supraclavicular region, and on Sept. 12 the right neck and supraclavicular region each received 35 per cent of the skin erythema dose (30 per cent tumor dose). The blood count on September 10 showed: Hemoglobin 90 per cent; red blood cells 4,508,000; leukocytes 10,500; basophiles 1 per cent; polymorphonuclears 41 per cent; lymphocytes 58 per cent.

The radiation has resulted in a diminution in the size of the nodes but not in a complete disappearance, due to the fact that the amount of radiation had to be reduced in view of the persistent tendency to leukopenia. The patient's general health is very much improved (Figs. 2, 3, 4, 5, and 6).

CONCLUSIONS

1. Two cases showed hematological pictures of aleukemic leukemia and subsequently chronic leukemic blood findings.

2. Radiation in sufficient quantity, from 30 to 65 per cent of the skin erythema dose, will cause a disappearance of the enlarged tumor masses or nodes.

3. Radiation in these cases must be controlled by blood counts: a disastrous leukopenia must be anticipated.

BIBLIOGRAPHY

(1) Ewing, James: Neoplastic Diseases. W. B. Saunders Co., Philadelphia, 1928, p. 406.

POLYRADIOTHERAPY IN DERMATOLOGY[1]

By W. I. LeFEVRE, M.D., Cleveland

THE title of this paper was suggested by an article appearing in the *Journal des Practiciens,* Paris, Oct. 24, 1925, by Saidman, on "Polyradiotherapy of Tuberculous Peritonitis," in which that writer advocates the use of the ultra-violet, the infra-red, and the roentgen rays in the treatment of this affection, associating the rays. He states: "The ultra-violet rays act on the general condition and hasten absorption; the infra-red on the pain and superficial infiltration; the roentgen rays on the deep." Tuberculous peritonitis is foreign to our subject, but the suggestion of the simultaneous use of more than one form of radiant energy is what I wish to convey.

The consecutive use of various modalities in the treatment of skin diseases is a common practice. That is, we first employ the light which in our judgment will be most efficacious in a given case; then, if the results are not satisfactory, another is substituted, until success crowns our efforts, or the patient drifts away in search of the "magic touch to make him whole."

For some time I have been using different wave lengths in the treatment of various dermatoses and feel sure this method is satisfactory in hastening the cure. Results have been attained in two different ways, as will be outlined later.

In the treatment of skin diseases my experience has been limited to the use of the roentgen ray, the ultra-violet mercury lamp (both air- and water-cooled), the carbon arc lamp (solar lamp), the carbon incandescent radiant lamp, and the infra-red lamp (the zoalite). With these, we have a wide range of wave lengths, ranging from the shorter roentgen to the longer infra-red. Each of these produces bundles of different wave lengths, some of which overlap at the ends of their respective spectra. (You will notice that radium has not been included, although its value is appreciated, and, in a few skin diseases, I think it is the remedy of choice, but I do not use it.)

The use of radiant energy has revolutionized the practice of dermatology in the past decade. No longer will the prescription pad and fountain pen suffice. The office has become a laboratory and the result of this innovation is more satisfactory to both doctor and patient. The number of skin lesions successfully treated in this modern manner are as numerous as man's allotted years, "three score and ten"; in fact, MacKee, in his book on "X-ray and Radium in the Treatment of Skin Diseases," mentions eighty-odd diseases amenable to these measures.

My remarks will be limited to the combined use of the ultra-violet and X-ray in a few dermatoses. I use both the water- and air-cooled mercury quartz burners, generally the water-cooled in treating small lesions, the air-cooled in large areas. The action of these two lamps differs considerably, owing to their construction. The water-cooled burner is smaller and can be operated with greater intensity, giving off shorter wave lengths, which can be brought in closer apposition and applied through quartz, thus not being subject to the filtration of the air. These waves are more germicidal, and are indicated in infectious conditions. The law that "intensity varies inversely as the square of the distance" holds only in part, and not accurately as in X-ray. This is probably due to the larger surface source of the light. With this light there is no unit of dosage, the reaction being controlled by a large num-

[1]Read before the Radiological Society of North America, at the Thirteenth Annual Meeting, at New Orleans, Nov. 28–Dec. 2, 1927.

ber of factors. Broadly speaking, we want to produce a mild or severe reaction. Experience with our individual lamps must supply this information.

In using the X-ray, I employ the following method, which is offered as new: if it has been previously advocated, I have no knowledge of it. This method consists in varying the penetration during the treatment, accomplished by varying the voltage, all other settings remaining the same. It can be done in other ways, but this is the logical, easy, quick way to do it. In practice, I use two voltage readings and vary the time to obtain the dose, using the skin unit measure of dosage mathematically calculated, as advocated by MacKee. This method is accurate and practical when no filter is used. Divided skin unit doses are always used, except in cases of epithelioma. This method is advocated with the thought of enhancing the degree of absorption of the wave energy, as the cells are radiated, for, we must remember, it is only the wave length which is absorbed by the cell that has any therapeutic value. In other words, those waves which penetrate through the tissues are useless. Consequently low voltages, producing long wave lengths, are indicated in these conditions.

I have designated this as a new method, but in reality it is old, as old as X-ray therapy. In the pre-Coolidge hot cathode tube days, with the old gas tube, the degree of penetration changed considerably over a period of minutes, owing to the change of vacuum in the tube, this change being produced by the liberation of gases within the bulb, from the excessive heat. I am sure all of us treating cases under those conditions have occasionally seen cures or results which were marvelous—we could not explain or understand them. Now I am sure that in those rare cases we obtained a maximum amount of absorbable energy, a hit-and-miss method which could not be standardized or duplicated at will. With our present equipment we can standardize and duplicate the dose, but we cannot select

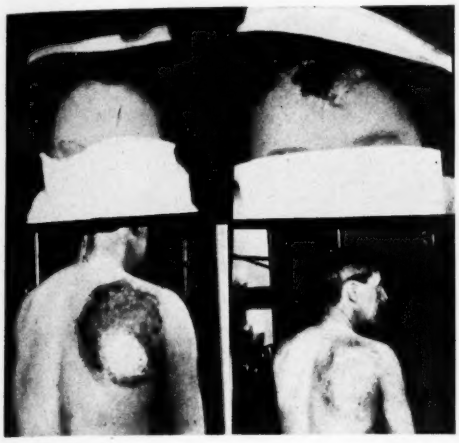


Fig. 1 (*above*). Case I. Epithelioma of the forehead; after (*left*) and before (*right*) treatment,
Fig. 2 (*below*). Case II. Blastomycosis; before and after treatment.

Fig. 3 (*above*). Case III. Seborrheic eczema; before and after treatment.
Fig. 4 (*below*). Case IV. Epithelioma of the nose; after (*left*) and before (*right*) treatment.

or isolate the wave length that will be effective; therefore, as suggested above, we vary the low voltage range to increase the chances of securing the wave length desired.

Perhaps to Sampson, as outlined in his book on "Physiotherapy Technic," belongs the credit of first advocating the combined use of the ultra-violet and X-ray. He supplements the ultra-violet with his so-called ionizing dose of X-ray, consisting of 5-inch spark gap, 8-inch skin target distance, 1-millimeter filter of aluminum, and 5 milliampere minutes, suggesting this technic in cases of tinea, psoriasis, and dry scaly eczema. I would reverse this method, supplementing a larger dose of X-ray with the actinic light. In the treatment of carbuncles and boils, he advocates an erythema dose through one millimeter of aluminum filter, 5- to 6-inch spark gap, followed by a third degree erythema ultra-violet application.

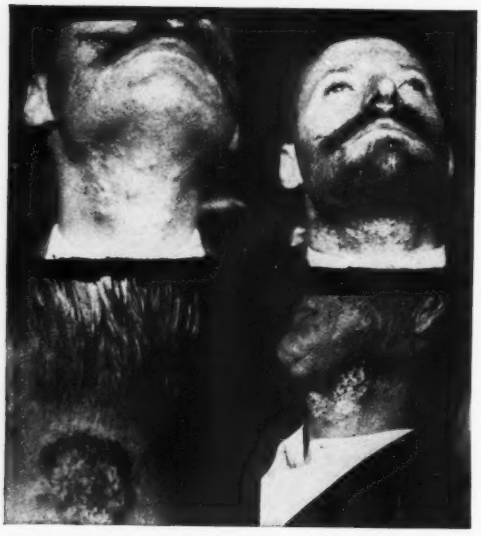


Fig. 5 (*above*). Case V. Sycosis vulgaris; after (*left*) and before (*right*) treatment.

Fig. 6 (*below*). Cases VII and VIII. Pyogenic infections; before treatment.

Here it may not be amiss to call attention to the article by the same author, entitled "Ultra-violet and X-ray as Physiologic Complements in Therapeusis," in the *American Journal of Roentgenology and Radium Therapy* for September, 1922. Elsewhere he states that the title should have been "A New Method of Increasing Skin Tolerance to Massive X-ray Dosage," advocating the use of the ultra-violet ray to produce tanning, thereby rendering the skin more tolerant to the X-ray massive dose. MacKee and Andrews, in an article in the *Journal of the American Medical Association* (Nov. 28, 1925), deny this action and state their conclusions as follows: "(4) Preliminary, generalized actinotherapy, even when continued for a long time, does not appear materially to decrease radiosensitiveness. (5) It is possible to administer several or many times the standard erythema dose of roentgen ray to normal human skin, without effecting more than a mild visible reaction: ignorance of this fact may account for the erroneous assumption that actinotherapy is a prophylactic against X-ray or radium injuries." This is of special interest to roentgenologists doing deep therapy.

Fig. 7. Case VI. Lupus vulgaris; before treatment.

The action of these two lights is radically different, but certainly one does not neutralize the other. Comparing their qualities, we find:

ULTRA-VIOLET RAY	X-RAY
Invisible	Invisible
Cold	Cold
Wave lengths from 2,000 to 4,000 Ångstrom units (therapeutic)	—1 to 10 Å.U.
Does not penetrate the skin	Penetrates the skin readily
Latent period 3 to 24 hours	Three days to 3 weeks (or more)
Will not destroy the skin	May destroy the skin
Is bactericidal	Is not bactericidal
Shorter wave lengths are less penetrating	Shorter wave lengths more penetrating
Tans the skin readily	Tans slowly
Skin tolerance increases	Skin tolerance decreases
Filters never used	Filters may be used
Stimulates the growth of hair	Causes epilation

This combined treatment is recommended in the following classes of cases: Acne rosacea, sycosis vulgaris, boils, carbuncles and pyogenic infections, tinea tonsurans, tinea barbæ, favus, blastomycosis, eczematoid ringworm, eczema marginatum, seborrheic eczema, chronic indurated eczema, psoriasis, lichen planus, pruritus ani and vulvæ, lupus vulgaris, lupus erythematosus, and epithelioma (all forms of basal cell).

This is rather a formidable list, including as it does many of the common and many of the serious diseases. It is quite impossible to give a hard-and-fast technic applicable to such a variety of cases. In a general way, the X-ray is used for its action on the deeper structure of the skin, the ultra-violet for its superficial stimulative effect, especially on the surrounding normal skin to increase the blood supply, thus aiding Nature in her natural healing method. In each individual case there is that personal equation which is gained by experience, supplemented by judgment, and governed by—for want of a better word—what we call intuition.

DISCUSSION

DR. JAMES M. MARTIN (Dallas, Texas): Now with regard to Dr. LeFevre's paper—he said a good many things that are interesting to me and some things I am not prepared to discuss. The main point is the use of ultra-violet. Down in Texas, we have so much ultra-violet light supplied naturally that I have not been interested at all in the use of artificial ultra-violet rays: in that country we try to keep out of the violet light as much as possible. I do not mean to criticize the paper by saying that ultra-violet rays are not useful; I am sure they are, when indicated and properly used. I have done some work along that line but it has not been very satisfactory. I have not intentionally tried to vary the wave length in the X-ray treatment of epithelioma and skin diseases, but I am sure we do it, because we cannot hold our dosage constant, try as we may, and we are getting a degree of variation during each exposure. If the Doctor is curing his cases and getting good results, he should go ahead with his method, because any good method that cures should not be changed for another. The treatment of epithelioma of the cartilage in either ear

or nose is unsatisfactory. I would like to refer such cases to my competitors. We can cure some of those cases and we do cure some, but we do not cure them all and they are not satisfactory cases for treatment.

Dr. Rollin H. Stevens (Detroit): Now as to Dr. LeFevre's paper—I have had no recorded experience varying the wave length, but my practice for some time has been to treat no case at all without a filter. I always use at least one millimeter of aluminum in all cases, whether acne vulgaris, or anything else. I am very much afraid of using the unfiltered rays on any very large portion of skin, at any rate, because of what seems to me to be the greater chances of doing serious damage to the skin. So far as treating epitheliomas is concerned my practice now is to follow pretty much the Regaud method with radium. If I am not using X-ray, I give a good full dose, highly filtered. If it is a skin epithelioma, I will use as much as four millimeters of aluminum and possibly a piece of sole leather in between that, and give a full dose of the X-ray and then follow it up daily for some time, using the Pfahler chart to figure out my dosage, and keep up a constant radiation for about ten days or two weeks. I am quite sure our results are much better than they used to be when we gave the single massive dose. So far as the treatment of cases involving cartilage of the nose and ears is concerned, I have failed always with radium and X-ray alone. They do not get well; they simply get worse and worse. The only thing to do is to desiccate them and then they will get well. At least, that has been my experience.

Now as to the use of the ultra-violet ray and X-ray together — I have done quite a lot of that, especially in treating cases of psoriasis and some other skin lesions, by giving a dose of ultra-violet ray and then a very small dose of X-ray, never giving more than half a so-called erythema dose —keeping even below that usually. I have felt for some time that the ultra-violet ray sensitizes the skin to the X-ray, and the reason I have used it so many times is because those cases will clear up better and quicker under the combination than without it. But you must be very careful, because, as Pfahler has pointed out in that beautiful set of experiments he carried out some time ago, there is very great danger of producing a severe X-ray reaction that may prove disastrous. I think one should keep within safe limits.

Dr. George W. Grier (Pittsburgh): Referring to Dr. LeFevre's paper—I know nothing about ultra-violet therapy. In regard to the treatment of epitheliomas with the X-ray, I believe that the massive dose method of treatment should practically always be used. I think an escharotic dose should practically always be applied to epitheliomas, and unfiltered radiation is the best, because if one uses very large doses and uses filtered radium and gives the same sized dose, one is apt to produce changes in the underlying tissues which are undesirable, and he will not produce the same dose with unfiltered radiation. In ear cases it has been my experience that the results are not very favorable. While Dr. LeFevre was showing you the slides, it occurred to me that on the next one of these cases I treat, I intend to try 200,000-volt technic. I think the reason these cases are unfavorable is that the most of them are the prickle-cell type of cancer. We all know that X-ray therapy is very unsatisfactory in epithelioma of the vulva. A very large lesion I have seen in the past year I have treated with high voltage technic and it has responded so well that I think I will use that treatment in the next case of epithelioma of the ear.

There is just one more point I want to make about treating skin lesions with the X-ray: that the size of the area treated—I have said this so often that it seems super-

fluous to say it again, but I see this point disregarded constantly—that the size of the area treated has a great deal to do with the effect which is produced. When one is treating skin lesions with unfiltered radiation, and gives nearly a maximum dose, 90 per cent of the maximum dose—if he has calculated this dosage from an area of a given size (and the area that is usually used to calculate this dosage may be about the size of a quarter) and then treats the whole side of the face, using the same factors that he knows are perfectly safe, because he has tried them over a small area, he is bound to have disastrous results. Again, it is unsafe to use fractions of an erythema dose, a quarter or a half skin unit, and repeat that dose once or twice a week, as is quite often the practice in treating skin lesions. I say, it is unsafe to use this method of treatment unless one keeps an accurate record and figures out the effect of that dosage: it is unsafe to keep on using half a skin unit twice a week for an indefinite period. I do not see how dermatologists keep on with that class of treatment without disastrous results.

DR. LEFEVRE (closing): Perhaps in a paper such as I presented I should not have brought up the subject of epithelioma, because it was the only disease in which I had to make exceptions. However, I am glad I did so, because it is a very important subject and, since I notice that the discussors are each using a different technic, I think the interchange of ideas may prove profitable to all of us.

INTRACRANIAL STUDIES BY VENTRICULOGRAMS[1]

By W. R. BETHEA, M.D., Baptist Memorial Hospital, MEMPHIS, TENNESSEE

VENTRICULOGRAMS are radiographs of the ventricular system after the cerebrospinal fluid has been completely or partially replaced by air. In order to understand the abnormalities in the ventricular system it is necessary to have a minute knowledge of anatomy and physiology. To review these briefly, let us recall that the intracranial ventricular system is composed of two lateral ventricles, a third ventricle, and a fourth ventricle.

One lateral ventricle lies in each hemisphere of the brain and is composed of anterior, posterior, and temporal horns. The anterior horns are somewhat larger and more rounded, while the posterior horns come more to a point and are separated much farther apart than the anterior horns. The temporal horns are the smaller and extend downward and forward. These horns form more or less a wishbone-shape, as is seen in the lateral view. The capacity of the normal ventricle is about 60 c.c.

From near the center of the anterior horn on the medial side is the foramen of Monro, which connects each lateral ventricle with the third ventricle.

The third ventricle is slightly oblong in shape, is situated just below and between the two lateral ventricles, and is seen between the anterior and temporal horns on the lateral view. From the posterior portion of the floor of the third ventricle there is seen a funnel-shaped opening, leading downward and backward into a comparatively narrow channel, the aqueduct of Sylvius, which connects with the fourth ventricle.

As is seen laterally, the fourth ventricle is a small triangular shaped cavity located in the posterior fossa. From this triangular shaped cavity, at the upper and posterior portion of the triangle, is seen the foramen

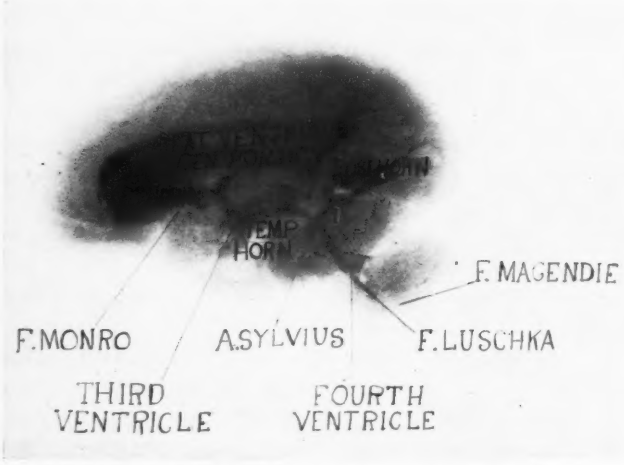


Fig. 1. Ventricles from lateral exposure made by injecting pyelographic medium into fresh autopsy specimen.

Fig. 2. Same specimen as shown in Figure 1, seen from above downward.

[1]Read before the Radiological Society of North America, at the Thirteenth Annual Meeting, at New Orleans, Nov. 29, 1927.

Fig. 3. Anterior-posterior view showing marked dilatation in hydrocephalus.

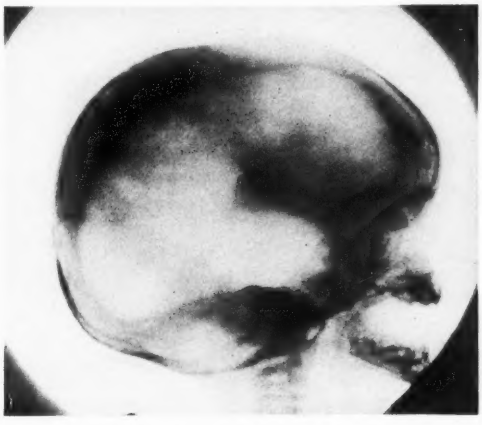


Fig. 4. Lateral view showing large hydrocephalus.

of Magendie, and at the lower and most dependent angle are seen the foramina of Luschka. These three foramina connect the ventricular system with the subarachnoid space.

The cerebrospinal fluid enters the lateral ventricles through the choroid plexuses, one of which lies on the floor of each anterior horn, and passes through the foramen of Monro into the third ventricle, and from the third ventricle through the aqueduct of Sylvius into the fourth ventricle; then through the foramina of Luschka and Magendie to the subarachnoid space, where it is taken up by the blood stream. This anatomy is illustrated by Figures 1 and 2. This illustration is made by taking a brain after autopsy and, before hardening or shrinking, injecting the ventricular system with neosilvol and radiographing from above downward and laterally.

Indications for ventricular study are: persistent headaches that cannot be accounted for otherwise, tumors, abscesses, edema, hydrocephalus, epilepsy other than congenital types, congenital deformity.

The value of the study depends, first, on the safety of the procedure; second, on the reliability of the technic, and third, on the interpretation of the findings.

In Grant's (1) analysis of 392 cases, ventriculograms have been of localizing value in 79.3 per cent and the mortality following ventriculography was 8.1 per cent of all cases.

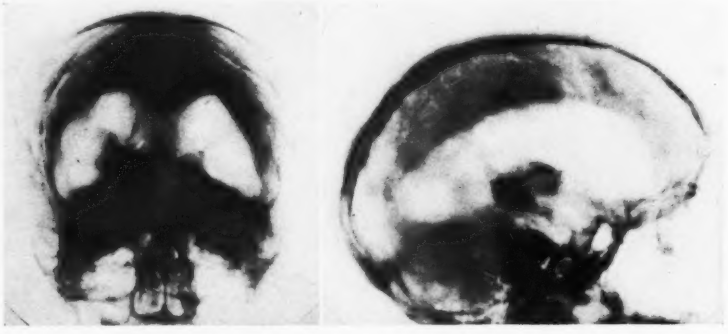
In our series of 76 cases we have had only two deaths over a period of eight years, and in the negative cases there have been no ill effects following ventriculography. In the two deaths from our series the pathology of the condition was such that death would have occurred in a short time had the ventriculograms not been made. However, there are varying percentages of mortality in the literature. Regardless of the mortality, we are dealing in most cases with a hopeless condition so far as recovery without surgical interference is concerned, and it is our opinion that every case should have the benefit of ventricular study, as this is the most valuable and offers to surgeons the most information in the possible cure of such cases. Only about 5 to 7 per cent of brain tumors can be diagnosed from simple head radiographs, and those after calcium deposits have taken place in the

tumors or some pressure deformity is manifest in the skull wall.

The surgical procedure of introducing air into the ventricles will not be discussed further than to say that the direct method has been the choice of our neurological surgeons.

The posterior horn on one side is tapped through a trephine opening. If sufficient air can be introduced through the one side for diagnosis, one side only is tapped. If, for any reason, sufficient air cannot be introduced through one side, there is no hesitancy in tapping the ventricle on the opposite side in like manner. But we feel that the intracranial pressure is not so seriously disturbed when only part of the fluid is removed. We have not had experience with the spinal method in ventriculography and do not think it very valuable in the study of the ventricular system, but employ it in our suspected cord tumors.

Any substance introduced into the ventricles must be non-irritating, non-toxic, and readily absorbable. In Dandy's (2) experiments with pyelographic media on dogs, thorium, potassium iodide, collargol, argyrol, bismuth subnitrate and subcarbonate—used in various dilutions in the ventricles of the dogs—all produced death in the animals.



Figs. 5 and 6. Marked dilatation of ventricles in adult from blocking by tumor in the fourth ventricle.

Fig. 7.

Fig. 8. Lateral exposure showing anomaly of anterior horns of normal ventricles.

It was after noting the shadow of gas in the intestinal tract that air was successfully used as the medium.

Our radiologic technic is as follows: Four views are made, right and left lateral, anterior, and posterior. The patient is first radiographed as he is lying on the stretcher upon entering the department. This records the ventricle that is uppermost at that time, after which, by gently turning the patient to another position, the head is rocked from side to side to get the air properly divided in the two ventricles. Then a film is taken from the anterior, which gives the outline of the anterior horns. The patient is turned on the opposite side from the first position, and the third film is taken. For this exposure the head is slightly lowered, to bring the air well into the third ventricle, at the same time filling the lateral ventricle that is uppermost. Next the patient is turned flat on the abdomen and the fourth exposure is made, after carefully rocking the head to

Fig. 9. Autopsy specimen showing lack of development of entire lateral brain due to angiomatous tumor, probably from birth hemorrhage.

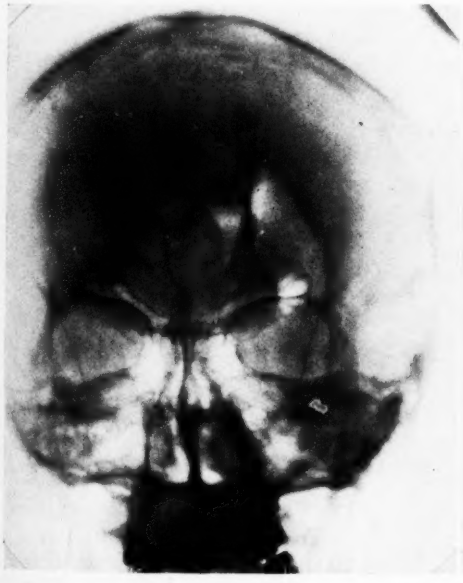


Fig. 10. Deformity of posterior horns and their displacement to one side by pressure from tumor in opposite side.

Fig. 11. Displacement of anterior horns to unaffected side and pressure deformity on horn of affected side.

Fig. 12. Pressure deformity and reduction in size of horn on affected side, and some displacement of anterior horns to unaffected side due to pressure.

Fig. 13. Obliteration of posterior horns of lateral ventricle due to pressure from tumor in occipito-parietal region.

get the distribution of the air from one ventricle to the posterior horns of both ventricles. This is the most difficult position in which to get an equal distribution, as the foramen is located so far forward between the anterior horns.

One should remember that air in the ventricle will behave exactly as air and water in a bottle; the air seeks the upper level in any position in which the head may be placed. The most common error one has to avoid in the technic is the improper distribution of air and improper outline of some part of the ventricle. Plates should be immediately inspected and if sufficient air has been introduced and yet the ventricles are not properly shown on one side, a second plate can be made in a few minutes for a check on this deformity.

Any brain pathology of sufficient extent and so situated as to cause an increase in intracranial tension will produce a change in the size, shape, or position of the ventricular system. Obstruction to the circulation of the cerebrospinal fluid at any point in the system causes dilatation above the point of pressure. The ventricular deformities may be symmetrical or asymmetrical, varying in size, shape, or position. In tumors of either of the cerebral hemispheres the lateral ventricles show the greater deformity, the horn nearest the tumor showing the greatest pressure—entirely obliterated, even. Often the entire ventricular system is displaced to the unaffected side, from pressure, although the ventricular shadow may be shifted in any direction. Therefore, the lesion produces the greatest filling defects on the portion of ventricle nearest its location. The ventricle on the unaffected side may or may not be changed at all. Such lesions are, as a rule, not so difficult to localize. Neurological symptoms are not present in cases in which the tumors involve the silent areas, to help in locating these lesions. The silent area lesions are the most difficult from a clinical standpoint, and, if below the tentorium, from a ventricular study.

Hydrocephalus is due to an obstruction to the circulation of the cerebrospinal fluid anywhere in the middle ventricular system, so that it is important to determine whether

Fig. 14. Anterior-posterior view showing pressure deformity with slight variation in size of anterior horn, suggesting tumor in frontal lobe.

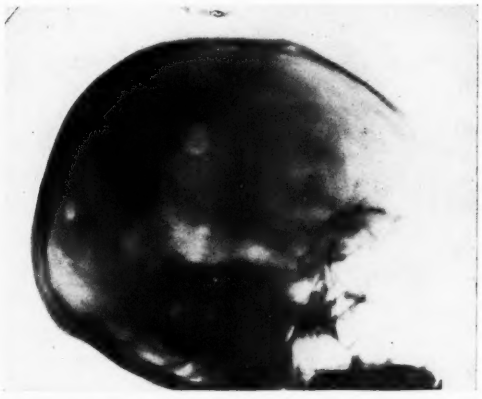


Fig. 15. Obliteration of anterior horns; dilatation of posterior and temporal horns, suggesting tumor in temporal lobes, with some pressure on the foramen of Monro, obstructing free circulation of spinal fluid.

this block is above or below the tentorium. When the lateral ventricles are dilated and the third and fourth not visualized, the lesion is above the tentorium. If the third is clearly dilated and the fourth not visualized, the lesion is in the posterior fossa or below the tentorium. If the foramina of Magendie and Luschka are blocked, the entire system will be dilated.

Elsberg and Silbert (3) have recently pointed out the fact that distention of the lateral ventricles occurs in a somewhat different way, depending upon whether the block be situated below or above the ten-

Fig. 16. Cross-section of autopsy specimen with marked deformity on lateral ventricle on affected side from abscess centrally located in frontal lobe.

Fig. 17. Longitudinal section of autopsy specimen showing displacement of lateral ventricles; also, obliteration of anterior horn on affected side, with large glioma superficially located in frontal lobe.

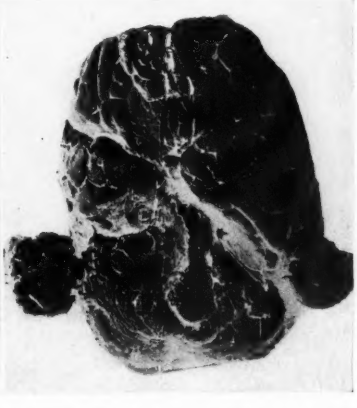


Fig. 18. Autopsy specimen viewed from base, showing multiple gliomas lying outside of their bed at the base of the brain.

torium. In the first instance the anterior horns are relatively much more dilated than the inferior or posterior; in the second instance all three horns are distended to the same degree. Furthermore, these authors show that a tumor in the cerebello-pontile angle or in a cerebellar lobe can press upward and distort the posterior horn of the lateral ventricle on that side. We have also found this to be true in our observations, but we agree with Grant (1) that the presence or absence of distention of the third ventricle along with hydrocephalus of the lateral ventricles is of vastly greater importance in determining whether the lesion lies above or below the tentorium.

Any deformity of a ventricle or part of a ventricle must be constant in all positions to be diagnostic, as deformities that are not constant are due to errors in technic. Communicating hydrocephalus may be determined by the intraspinal method of injecting air or the use of dye in the spinal canal, and tapping the lateral ventricle to see if the fluid is colored. Anomalies of the ventricles may be misleading at times. The shape sometimes will vary, both in the anterior horn and posterior horns.

Penfield (4) has shown that occasionally the posterior horn of a lateral ventricle may be absent. We have not had a case showing such a deformity.

Swift (5) has shown a lack of development of one hemisphere, with angioma on the cortex, that produced a marked shift in the ventricular shadows; also one was much smaller.

CONCLUSIONS

1. The ventricles can be clearly outlined with little risk to the patient.
2. Diagnosis and localization of pathology can be made early.
3. The surgeon has a guide in his operative procedure.

REFERENCES

(1) Grant, Francis C.: Ventriculography. Am. Jour. Roentgenol. and Rad. Ther., September, 1927, XVIII, 264.
(2) Dandy, Walter E.: Ventriculography Following Injection of Air into Cerebral Ventricles. Ann. Surg., 1918, LXVIII, 5.
(3) Elsberg, C. A., and Silbert, S.: Changes in Size and Relations of Lateral Ventricles in Tumors of Brain; Preliminary Report. Arch. Neurol. and Psychiat., October, 1925. XIV, 489-501.
(4) Penfield, W.: Cerebral Pneumography; its Dangers and Uses. Arch. Neurol. and Psychiat., May, 1925, XIII, 580-591.
(5) Swift, George W.: Surg. Clinics of N. A., October, 1924, IV, No. 5, p. 1285.

DISCUSSION

Dr. J. Forestier (Aix-les-Bains, France): When you see a calcification in a certain part of the skull of a patient whom you have examined radiologically, there are few opportunities to check the anatomical findings with the radiologic ones; still, it is important for a patient who is to be operated upon to have a determination made as to whether such a calcification is pathologic or not, and whether or not it corresponds with the clinical symptoms. As for the visualization of the blood vessels, a new method has recently been introduced in Europe by Moniz, of Lisbon, by which it is possible to visualize the cerebral arteries in such cases of abnormality or pathology of the brain, especially in brain tumors. Its results show that it is possible, under general anesthesia, to inject from 5 to 10 c.c. of 10 to 20 per cent sodium iodide or silver solution into the internal carotid artery, and to have, when the film is properly taken, a very good picture of the blood vessels of the brain.

Referring to Dr. Bethea's paper, I wish to show three slides illustrating the possibility of making ventriculograms by injecting lipiodol into the ventricles or through a spinal puncture. When you inject ascending lipiodol containing 11 per cent of iodine into a ventricle, it is lighter than the cerebrospinal fluid and may be seen at the upper border of the ventricles. If you take several

roentgenograms in different positions, you can get a good idea of the form of the ventricles. In another case, shown by a second slide, an injection of emulsified ascending lipiodol has been made through a lumbar puncture and you can see that the opaque oil has made a thin coating on the walls of the ventricles—the dark linear shadow shows the outline of the ventricles.

There is one detail which I wish to bring out in closing. When air is injected to visualize the ventricles, and they are full, it is possible to remove this air quickly by putting the patient in the Trendelenburg position on any table which can be tilted a little. With the patient in this position do a lumbar puncture, and you will be surprised to see how easily you can remove nearly all of the air that has been injected. This technic minimizes greatly the untoward after-effects of ventriculography by air.

Dr. P. M. Hickey (Ann Arbor, Mich.): I wish to compliment Dr. Bethea upon his presentation of a highly technical subject and to emphasize the importance of ventriculography being undertaken only by a trained neurologic surgeon working in conjunction with a well trained radiologist. Some two years ago I saw Professor Sicard use an emulsion of lipiodol ascendens through a spinal puncture. The procedure seemed to be very much simpler than the injection of air, although, personally, I did not like the resulting radiographs as well as the ones obtained by air injection.

Dr. Gilbert C. Anderson (New Orleans): Dr. Bethea asked me to say a few words in regard to ventriculography from the surgical standpoint. I think the point Dr. Forestier has brought out is that ventriculography is not a *simple* surgical procedure, but one to be undertaken only when considered absolutely necessary for localization. In many brain lesions there occur more or less definite localizing signs or symptoms which lead the neurologist and surgeon to feel a degree of certainty in placing the lesion in a definite locality, but, of course, there occur a number of cases in which this is not true; here the ventriculogram is the one means of localization and perhaps the most certain we have at hand at the present time.

Dr. Dorman, of Atlanta, recently analyzed 100 cases of verified brain tumor. In this series he had done 20 ventriculograms—15 as an aid to and verification of a questionable clinical localization and in five cases the ventriculogram was absolutely necessary. In other words, in five cases he did not feel he had sufficient localizing signs to justify his proceeding without further diagnostic assistance. I believe his experience represents a very fair index of about how often recourse to a ventriculogram is desirable and helpful and how often absolutely necessary. I quite agree with Dr. Hickey that the operation should be done by a man trained in this particular line of work, and I cannot too strongly emphasize the need of co-operation between the surgeon and roentgenologist.

Dr. Coleman, of Richmond, has told me that it is his practice in doing ventriculography to have the operating room set up and everything ready to proceed with the craniotomy. He then makes his ventriculogram and holds everything in readiness until the films are developed and read. He will often proceed with the operation indicated. In this way he avoids some of the sudden deaths occurring after a ventriculogram. Such fatalities usually appear to be due to increase in intracranial pressure. It is nearly always true that after operation, ventriculography included, there is a wave of increased intracranial pressure higher than the original pressure. The procedure of choice is a fractional replacement of fluid by air, safety depending largely upon how slowly this is done, but under no circumstances can the procedure be considered en-

tirely safe. If there is evidence of increase in pressure after the ventriculogram has been made, the air may be removed from the ventricular system, but should be allowed to escape slowly. Unfortunately, most ventriculograms are done in the presence of increased intracranial pressure, the reason being that in the presence of increased pressure localizing signs lose some of their value, as they may be caused by general pressure rather than localized trauma due to the specific lesion; or there may be a plethora of confusing and contradictory localizing signs due to a generally increased pressure. The fluid should be drawn off very slowly, as in decompressing a distended bladder or other viscus. I have seen a number of cases examined postmortem after ventriculography and the ependymal lining of the ventricles showed multitude of petechial hemorrhages, probably due to sudden release of pressure.

DR. BETHEA (closing): I will add to what has been said by two of the gentlemen who have discussed this question, that highly skilled men only should do ventriculograms. We have seen some disastrous results from inexperienced men tapping ventricles. They cannot maintain the intracranial pressure in removing the fluid and injecting the air, and in many instances do not understand the after-treatment, as Dr. Anderson has called to your attention.

Regarding the Question of the Dose Unit for Roentgen Rays. Hermann Behnken. Strahlentherapie, 1928, XXIX, 192.

This is a preliminary report of the results of comparative measurements which were carried out in order to explain the discrepancy between the German and the so-called American Roentgen Unit. It appears that the unit as defined by the German Bureau of Standards and that of the University of Bonn (Grebe) agree with the unit of Duane, while there is still a difference of 4 per cent from the unit as defined by Kuestner and Glasser. The enormous discrepancy which was supposed to exist between Glasser and Behnken can not be explained. The author believes that some of the instruments may have changed in transfer between Germany and this country, but there may also have occurred errors in the measurements. A preliminary comparison between the unit of Solomon and the German unit leads to the equation:

1 *R* (Solomon) = 0.442 *R* (German) or
1 *R* (German) = 0.226 *R* (Solomon).

E. A. POHLE, M.D.

EFFECT OF X-RADIATION ON CRYSTALLINE AND DISSOLVED SUCROSE

By M. C. REINHARD and K. L. TUCKER, BUFFALO, NEW YORK

From the State Institute for the Study of Malignant Disease, Buffalo, N. Y.,
Burton T. Simpson, M.D., Director

IT is well known that intensive X-radiation causes certain colorless inorganic crystals to take on color; for example, sodium chloride becomes yellow and potassium chloride lavender. Coolidge and Moore[1] with high speed cathode particles from the former's new tube for the production of high voltage cathode rays outside of the tube were able to produce the same color in these crystals in a few seconds. The color is much more intense than that produced by the X-rays and evidently the color due to the X-rays is really a secondary effect of the cathode particles.

According to the above authors, X-ray spectrograms of the sodium chloride crystals radiated with cathode rays showed no variation from the unradiated. Similarly, Lind and Bardwell[2] radiated sodium chloride crystals with β-rays and found no change in the X-ray spectrum. This indicates that the substances or compounds have not been changed chemically.

No work has been reported, as far as the authors know, on the effect of either cathode (β) particles or X-rays on simple organic crystals. Would they also show a color change or chemical change if irradiated?

We have radiated such organic crystals as hydroquinone, picric acid, resorcinol, quinone with very intense X-rays for long periods of time without being able to produce a visible change. Sucrose (crystalline), however, became colored light brown after several hours of exposure, longer exposure resulting in a reddish-brown coloration. Inasmuch as it has been reported by Fernau[3] that there is produced an inversion of sucrose in solution by radiation and also since it is possible to quantitatively detect minute amounts of invert sugar in a sucrose solution by chemical examination, it seemed worth while to determine if there existed any invert sugar in the crystals of sucrose which were colored by the X-rays.

For this purpose we sealed several grams of crystalline sucrose[4] in glass tubes. These were wrapped in black paper to exclude any light, for we knew from previous work that daylight hastens the restoration to original form, and placed beneath an X-ray tube operated at 200 kilovolts and 30 milliamperes for various periods of time up to 107 hours. The exposure was not continuous, extending in actual time over several weeks.

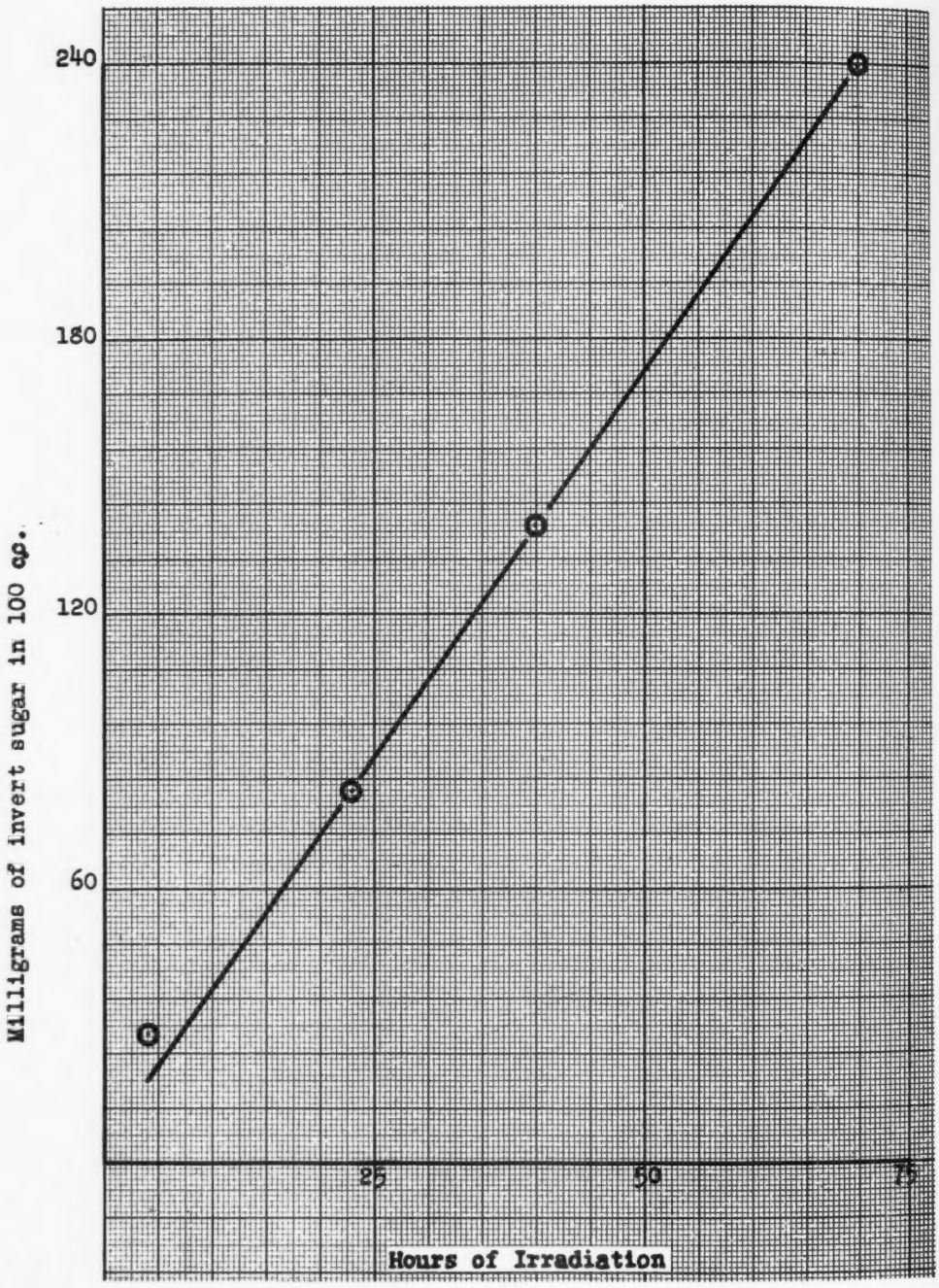
Following the radiation the sucrose was carefully weighed, dissolved in water, and the solution examined by the Kolthoff[5] method for the presence of traces of invert sugar in sucrose. Control solutions of sucrose were also made up and examined in the same way. The results are as follows:

Hours radiated	Color of crystals	Amount of invert sugar
35	Light brown	1.2 mg. per gram.
72	Brown	2.3 mg. per gram.
107	Reddish-brown	4.8 mg. per gram.

The controls failed to show any invert sugar.

Radiation of sucrose in solution.—As mentioned above, Fernau has shown that X-rays cause inversion of sucrose solutions and that the action is probably secondary, in that the radiation produces ozone

[1]Jour. Franklin Inst., December, 1926, CCII, 721.
[2]Jour. Franklin Inst., September, 1923, CXCVI, 375.
[3]Kolloid-Ztschr., 1923, XXXIII, 89.
[4]Pfanstiehl's sucrose contains 0.05 per cent moisture.
[5]Archives Suikerind, 1922, XXX, 867.



CURVE I

Amount of invert sugar produced by radiation of a 2 per cent sucrose solution.

and hydrogen peroxide from the water, which in turn act on the sucrose. However, no quantitative results are given. Is there enough sucrose inverted by radiation to admit of the possibility of this reaction being used as a measure of radiation intensity or dosage, such as is suggested by the work of Fricke and Morse[6] on the oxidation of ferrosulphate by roentgen radiation?

With this question in mind, water solutions of various concentrations of sucrose were made up, sterilized, and sealed in glass tubes. These tubes were also wrapped in black paper and exposed to the same radiation as the crystalline sucrose. The solutions were examined by the same method also and this determination showed that:

(1) Long exposures are necessary to produce a measurable change.

(2) In a dilute solution the relative amount of invert sugar formed is considerably greater than that formed in more concentrated solutions by equal doses of radiation. For example, 40 hours of exposure of 15 c.c. of a 2 per cent solution resulted in the formation of 19 mgrs. of invert sugar (a 6.5 per cent change), while the same amount of a 15 per cent solution showed 57 mgrs. (a 2.6 per cent change) and a 30 per cent solution showed 85 mgrs. (a 1.88 per cent change). Hussey and Thompson[7] also find with concentrated solutions of the enzyme trypsin that the percentile amount changed is much less than in dilute solutions.

(3) With increasing time of exposure of the same concentration the amounts of invert sugar produced increased directly. Curve I indicates this change in a 2 per cent solution.

In order to offset any temperature effects there were made up similar solutions which were sealed in glass tubing and inserted into lead cylinders and placed beside the tubes to be radiated for the same length of time. These control solutions showed no invert sugar.

Invert sugar in solution was not changed by 65 hours of radiation.

CONCLUSIONS

X-rays color crystals of sucrose reddish-brown. These crystals when dissolved show measurable amounts of invert sugar.

The production of invert sugar in sucrose solutions by X-rays is not satisfactory for dosage measurements because the amount formed with therapeutic doses is too minute for exact determination.

The amount of invert sugar formed is not proportional to the concentration of sucrose but is proportional to the time of exposure.

X-rays have no effect on solutions of invert sugar indicating a secondary effect on the sucrose.

[6] Am. Jour. Roentgenol. and Rad. Ther., 1927, XVIII, 430.

[7] Jour. Gen. Physiol., 1923, V, 647.

TREATMENT OF CANCER OF THE CERVIX[1]

By CLYDE O. DONALDSON, M.D., KANSAS CITY, MISSOURI

THAT the incidence of cancer is actually on the increase there is no doubt. The general public and many physicians entertain a doubt as to the curability of cancer in any stage. Though we have no definite knowledge as to the cause of cancer, we do know that chronic infections of the cervix, and cervical lacerations which subject the tissues to chronic irritation, are pre-cancerous factors. We also know that cancer begins as a local lesion, which at one time in its clinical course is amenable to treatment. It may be treated by surgery or electrocoagulation or it may be destroyed by radium or X-ray.

The treatment of cancer of the cervix presents one of the serious problems of today and is of interest not only to the profession but to the laity as well. Shall it be treated by radical operation or by radium or by a combination of surgery, radium, and post-operative X-radiation? Unfortunately, early cancer of the cervix is a rare finding because the majority of patients do not present themselves for examination until the disease is fairly well advanced. Hence, our efforts must be toward prophylaxis—that is, the cure of pre-cancerous lesions such as infections and traumatism of the cervical tissues.

When first seen by the physician, the lesion has usually passed beyond the incipient stage, because bleeding, which to the patient is the alarming symptom, means that the tissue has already begun to break down and superficial necrosis has taken place.

A fairly similar condition prevailed for many years in the treatment of tuberculosis, but by organized propaganda and proper education of both the profession and the public, it has been demonstrated that tuberculosis is amenable to treatment and is curable. So, also, is cancer, if it can be discovered in the initial stage when it is a simple localized growth. It must be conceded that if a permanent cure is to be obtained in carcinoma, either by means of radiation or operation, the treatment must be carried out in the early stage.

According to Schmitz, of Chicago, the cases that present themselves for treatment fall into one of four groups:

1. A clearly localized, simple growth, the primary ulcer or nodule, with no extension of infiltration into the surrounding cervical tissues.

2. The nodule or ulcer with beginning infiltration of the surrounding cervical tissues, but which has not extended beyond the confines of the cervix.

3. Growths with infiltration of parametrium. This can be recognized by examination *per rectum.*

4. Cancer of the cervix with extensive ulceration, necrosis, and infiltration of surrounding tissues, with sepsis, hemorrhage, and cachexia.

In the first group, with the initial, local lesion, a simple hysterectomy will remove all the growth. This can be accomplished by operation or equally well by radium, without the danger incident to an anesthetic and operative trauma.

Of the second group, the same may be said as of Group 1.

In Group 3, where the parametrium has been infiltrated, more can be expected from radium followed by deep X-ray therapy than can possibly be expected from surgery. A wide panhysterectomy, popularized by Wertheim, has not proven successful because of the primary mortality and the small percentage of cases (35 per cent) suitable for operation. The results of operation in

[1]Read before the Radiological Society of North America at the Thirteenth Annual Meeting, at New Orleans, Dec 1, 1927.

the third group, and more especially in the fourth group, have been so disappointing that surgery has been practically abandoned in favor of radiation.

Figures are very unreliable owing to personal factors—the skill of the operator, differences in pathological reports, methods of classification, etc.—but at least radium statistics are as reliable as those of surgery. The accumulated evidence points to the fact that cancer of the cervix should always be treated by radiation except in the early, localized case, where either treatment yields equally good results. Surgeons may take exception to this statement on the ground that no treatment is good treatment which does not yield material for pathologic study.

This is a reasonable point and worthy of discussion. Surgical treatment permits of careful study of the entire tissue, yet it will be admitted that very few physicians are capable of properly interpreting microscopic tumor pathology. It is not intended to belittle the value of tissue study, but the percentage of error, as it is done in the average hospital, is probably as great as in clinical observation alone. This is in no sense a reflection on the pathologist, but indicates the difficulty of tissue diagnosis.

It is considered entirely proper to remove a section of tissue for microscopic study in every case where there is doubt of the diagnosis, whether the treatment is to be operative or radiative. This should be done very carefully, probably with the hot knife if surgery is contemplated, or at the time of treatment if radiation is the method of choice. Tissue examination should do more than make the diagnosis of cancer; it should classify the tumor according to degree of malignancy, based upon the cell type, fibrosis, and hyalinization. These factors will aid greatly in making a prognosis. Radiologists have been criticized for treating lesions of the cervix without making routine tissue examinations, and this should be done whenever there is the slightest doubt of the diagnosis. It is difficult to see where tissue sections could be of value either in diagnosis or prognosis in advanced cases. It must not be forgotten that the interests of the patient are paramount to the interests of pure science, and if no information of value can be gained by tissue section, such routine practice, for the sole purpose of proving the diagnosis, is probably taking unwarranted liberties with the patient.

Examination of a woman suspected of having cancer of the cervix should be done most carefully. First, a digital examination is made of the vaginal vault and the cervix. Second, the finger is inserted into the rectum and the pelvis is explored as high up as possible. Third, the vaginal speculum is inserted and the parts carefully inspected. The knee-chest position is practical, for so the cervix can usually be inspected to good advantage, with no trauma. If a lesion of the cervix is found, the outer limits of the disease are determined. If the lesion is confined entirely to the cervix, the examination may be stopped until such time as it is practical to remove a section for microscopic study.

Cervical erosion is sometimes difficult to differentiate from early cervical cancer. Bowing states that in cancer the line of demarcation between the lesion and the normal tissue is sharply defined, whereas in cervical erosion the lesion gradually fades off into the normal tissues. Superficial capillaries at the edge of the lesion are quite prominent in cancer. In a fungating growth the diagnosis is rarely in doubt.

If the lesion is one for which radium is indicated, the position, size, and direction of the cervical canal are noted, so that the proper applicator may be made up, ready for insertion.

The treatment is conducted with as little fuss as possible. The lower bowel is emptied by enema, the bladder emptied, and

a sodium bicarbonate douche given. The patient is put in the position best suited to expose the lesion, either the knee-chest or the dorsal position, and the radium applicator placed. It is desirable to insert the radium into the cervical canal, but if this is productive of too much trauma, it may be packed against the cervix. The vaginal vault is then packed to push the bladder away from the radium. During the treatment the bladder should be emptied at least every four hours; the horizontal position and the large vaginal pack will necessitate the use of the catheter in many cases.

The dosage may vary from 2,000 to 5,000 milligram hours, depending upon the extent of the lesion, the location and type of applicator, and the size of the vagina. The radium should be well filtered through at least one millimeter of copper, silver, or lead, plus the rubber catheter. Most operators use 50 to 100 milligrams of radium—the amount makes no particular difference in the result. It is well to deliver the entire dose as soon as possible, making not more than three applications as a rule, all within one week.

The extent of the growth will, of course, determine the prognosis more than any other factor. It is quite obvious that a small, localized cancer of the cervix will be more amenable to treatment than one that has invaded the parametrial structures. Many cases are so far advanced that they are incurable by any type of treatment yet devised, but the palliation of such symptoms as pain, hemorrhage, odor, loss of weight and strength, fully warrants the radium treatment.

[This paper was supplemented by a moving picture film illustrating the *modus operrandi* of the 200,000-volt X-ray treatment of carcinoma of the cervix.]

AMERICAN ASSOCIATION OF RADIOLOGICAL TECHNICIANS

The 1929 convention of the American Association of Radiological Technicians will be held in Chicago on May 20, 21, and 22, 1929.

The program is now in active preparation and further details will be published at an early date.

New material and new features will be introduced and an interesting and instructive meeting is anticipated.

THE PROGRAM COMMITTEE
H. A. TUTTLE,
Chairman.

EDITORIAL

M. J. Hubeny, M.D. . . . . *Editor*

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EXTERNAL DISTANCE APPLICATIONS OF HEAVILY FILTERED RADIUM[1]

The general principles of X-ray and radium therapies are so much alike that the transition from a deep X-ray to a deep radium technic should offer but little difficulty to the expert roentgenologist. Such terms as "erythema dose," "portal of entry," "filter," "cross-firing," "spherical dispersion," "absorption," "scattering," "intensity of central as compared to peripheral beam," and "radiosensibility" need no definitions, being equally applicable to X-ray and radium, and they are, as a matter of fact, worked out by physical and biological experiments of the same general character.

From the standpoint of quantity available and economy in use X-ray has an outstanding superiority. It is this unlimited quantity which enables us to reduce the spherical dispersion factor to a minimum by taking great distances from the source to the skin, and by this same maneuver to secure an isodosis in the depths much more easily. If the gamma rays of radium were securable in the same quantity as X-rays, their greater penetration and greater constancy would make them very much superior in deep treatment. It is this thought that has kept alive the hope that X-ray apparatus manufacturers would produce machines and tubes allowing the use of a million or more volts in place of the 200,000 in common use.

Under present conditions, where the amount of radium available for use in any one place is only a few grams at most, its employment is justified only on the conception and proof that gamma rays are, in the same dosage, more efficient than X-rays in injuring or destroying pathologic tissues and leaving normal tissues intact. It is a fundamental physical principle that the effect of any quantity of ray in any substance is proportional to the amount absorbed and is independent of the length of the rays. This general fact, supported by a great many experimental studies with X-rays of different wave lengths, has led to a general opinion that the effects of X-ray and gamma ray must be exactly the same.

As a matter of fact, it is still obscure as to what actually takes place, both from the physical and biological aspects, when a human body is subjected to radiation. It may be that there is developed a greater quantity of secondary radiation (Compton rays) from gamma than from X-rays, once they have passed into the body. It has long been my feeling that dose for dose the gamma rays are decidedly superior to X-rays. This was first noticed in connection with cases of splenomyelogenous leukemia and Hodgkin's disease—apparently much more striking effects were secured on the disease and much less upset to the patient where radium was used.

As measured in *R*-units, gamma rays obtained from radium through a lead filter 2 mm. in thickness produce erythema at about 2,300 units, as compared to 1,200 units of deep X-ray obtained through 1 mm. of copper, 1 mm. of aluminum, and a peak voltage of 220 kilovolts. This is what one would

[1]Read by title, Thirteenth Annual Meeting of the Radiological Society of North America, at New Orleans, Nov. 28–Dec. 2, 1927.

expect from the comparison of soft and hard X-ray effects. The erythema dose at a distance of one inch with the radium under these conditions is about two gram hours. The absorption of rays in the air is almost negligible, so that by applying the inverse square law the erythema at any distance can be easily calculated. The actual absorption of gamma rays as compared to the X-rays in tissues is shown from Tables I and II. In Table I the facts as shown by a series of measurements in water as to the absorption of gamma rays, indicate that at eight inches 58 per cent are absorbed, at six inches 47.1 per cent are absorbed, and at four inches 32.2 per cent are absorbed. In Table II, at six inches 84 per cent of the X-rays are absorbed, at four inches 71.3 per cent, and at two inches 39 per cent. It is evident that the gamma rays, so far as water is concerned, are decidedly more penetrating. Using the table for absorption in water as an equivalent for absorption in tissues and combining the factor of spherical dispersion with this factor of absorption, it is possible to approximate the actual dosage received in any depth of tissue up to eight inches or 20 cm. I am offering this table simply as a rough rule for measuring to those who are unfamiliar with the facts.

By actual experience we have observed that, using a distance of four inches from the skin and applying 16 gram hours of radiation, in a large percentage of cases a permanent amenorrhea is produced. This dosage represents on the skin approximately one-half of an erythema dose and in the ovary, estimating a distance of four inches below the surface as measured from the middle line, about 8.5 per cent of an erythema dose. To secure similar results by deep X-ray dosage from 28.7 to 40 per cent of an erythema dose must be applied to the ovaries. This same dosage is effectual in many cases of fibroid tumors of the uterus and in reducing the spleens in splenomyelogenous leukemia and the glands in Hodgkin's disease. It is more economical and equally efficient in the latter troubles to treat at closer skin distances and to use multiple portals. In general, the sensibility of the various malignant carcinomas and sarcomas varies to gamma rays as it does to X-rays. Lymphosarcoma and angiosarcoma are the most sensitive of the mesoblastic malignant tumors, and carcinomas of the testicle, thyroid, breast, and ovary of the epiblastic growths.

TABLE I

ABSORPTION OF GAMMA RAYS IN WATER

2 inch value = 0.279 R.- min.				
Inches of Water	R.-min. Ideal	R.-min. Actual	Apparent Absorption	Percentage of Apparent Absorption
0	.279	.279	....	....
1	.124	.108	.016	12.8
2	.0698	.055	.015	21.5
3	.0446	.0319	.013	29.1
4	.0310	.0210	.010	32.2
6	.0174	.00923	.0082	47.1
8	.0112	.00475	.0065	58.0

TABLE II

ABSORPTION OF X-RAYS AT 200 K.V.

Depth of H_2O below Chamber, Inches	Time of Discharge (Average), Seconds	R.-min.	Percentage of Zero Depth
0	19	102.0	....
1	24	80.6	83.7
2	33	58.7	61.0
3	48	40.3	41.8
4	70	27.7	28.7
6	125.5	15.4	16.0
8	....	....	....

In our early work for distance radiation we employed a radium open package consisting of a measured thickness of felt to secure a desired distance, and a metal box containing the radium. The apparatus was light; it was convenient to treat the patient in his own bed, and, as the radium was placed directly over the part to be treated, it was thought that the spherical dispersion factor was enough to protect the body as a whole from too much radiation. As a matter of fact, at a distance of two inches it is possible in this way to give several hundred gram hours of radium radiation in the course of two or three months, without any marked injurious effect upon the blood or the function of the organs. This has actually been done in a number of cases of Hodgkin's disease as well as generalized malignancy. The method is still an admirable one for treating breast cancer, thyroid cancer, and all forms of comparatively superficial involvement. Where, however, in order to secure intense depth dosage in relatively small volumes, it is necessary to adapt to this purpose some method comparable to X-ray cross-firing, we employ a heavy lead cylinder with walls an inch in thickness and with a portal of from two to four inches on the skin. The inch of lead reduces the amount of gamma rays to about 20 per cent of that applied to it. This makes possible the use of many portals in a comparatively small area; by increasing the thickness of the walls of lead to one and a half inches only 10 per cent of the rays get through, and at five inches practically all are absorbed. The increased weight and cumbersomeness of great thicknesses of lead is a considerable disadvantage in manipulation, and for practical purposes we are quite satisfied with the one inch apparatus. We have observed that there is much less nausea and general disturbance following heavy treatments, where the cylinder has been used, than where equal dosage is given by the open package method. It is also possible to give a complete dose at a single sitting with the radium cylinder, a thing it is almost impossible to do with X-ray on account of the general reaction following such a treatment. Nevertheless, there are, with the radium as with the X-ray, many things to be said in favor of the divided dose method, as apparently equally good results are obtained with markedly less disturbance.

In general, the radiation is limited, as with X-ray, by the skin tolerance and the tolerance in certain regions of susceptible tissues. Over-radiation of the adrenals, the kidneys, the intestinal mucosa, the salivary glands, the pancreas and the liver must be so far as possible avoided by the choice of fields and the direction of the beam of radiation.

When radium in large quantities is employed special attention must not only be applied to the patient but also to the workers in order to prevent injuries. If the radiation source is the radium salt, it is possible to have a special treatment room and by lead covers of some inches and mechanical contrivances for moving such an apparatus, to produce conditions similar to those in an X-ray room. In our own case, using radium emanation as our source, we have met this problem in a different way. The patient is brought into the treatment room, the field of radiation studied, the cylinder set, adjusted, and directed at the distance actually decided on. When everything is in place a nurse brings in a container carrying the radium and this is placed in the apparatus and the treatment given. We change our nurses every month to two months and have never observed any disturbance of the blood, menstrual function, or general health. The permanent operators are never actually exposed to the large amounts of radium. The average amount of radium collected in our cylinder is about 4 grams. Occasionally as much as 5 have

been in use, depending on whether the total amount available is being employed solely for the distance treatments or for other treatments as well.

I have made no effort in this short résumé even to attempt an estimation of the amount of radiation necessary to destroy epithelioma. Small skin epitheliomas up to the size of a 5-cent piece are completely removed at a distance of one-fourth inch by one gram, 15 minutes, gamma radiation. This would mean four gram hours' radiation at one inch. An interesting case of large involvement—the size of an adult man's fist—of the glands of the right groin, secondary to a squamous cell carcinoma of the vulva, has almost completely disappeared under 50 gram hours' radiation at a distance of 5 inches from the skin and 6 inches from the lower surface of the tumor. This has been accomplished without an actual erythema of the skin. There is undoubtedly a very wide range of difference between cancers of the same histological structure, and there is probably no such thing as a "cancer dose" which can be used in a general way.

By multiplying the portals and varying the distances it is possible to give gamma radiation to any part of the body to which X-radiation could be given, and it seems that a dosage which offers possibilities of cure can be given with less chance of doing injury to the normal surrounding tissues.

CURTIS F. BURNAM, M.D.
Howard A. Kelly Hospital,
Baltimore, Md.

FELLOWSHIPS AT CHARITY HOSPITAL, NEW ORLEANS

The Board of Administrators of the Charity Hospital of Louisiana, in New Orleans, one of the oldest and largest hospitals in this country, announces that that institution has, on the recommendation of its Superintendent, Dr. A. Vidrine, created Fellowships in the various medical specialties, including radiology. The Fellows will be appointed from applicants who must have served at least one year as interne in a Class A hospital, and are to serve for two years, one year as Junior, the next year as Senior, after which time they will receive certificates or diplomas and will be eligible for the position of full-time assistant in their respective departments.

Dr. Amédée Granger is Director of the Department of Radiology of the Charity Hospital.

TERMS USED IN RADIOLOGY

RECOMMENDATIONS OF THE SUBCOMMITTEE ON NOMENCLATURE[1]

By HENRY K. PANCOAST, M.D., CHAIRMAN, PHILADELPHIA,
GIOAOCHINO FAILLA, D.Sc., NEW YORK,
and
W. WARNER WATKINS, M.D., PHOENIX, ARIZONA

To Dr. Thomas A. Groover, Chairman of the General Committee of the Section on Radiology of the American Medical Association, comprising representatives of allied groups of radiological organizations:

Your Subcommittee on Nomenclature begs to submit to your committee as a whole the following recommendations:

1. The term "radiology" should be employed to designate the broad subject of the medical use of roentgen rays in diagnosis and treatment and of radium in treatment.

2. The individual engaged in such work should be designated as a "radiologist," when he employs these agents as a specialist in this particular branch of medicine. (Note: The terms "radiology" and "radiologist" have not been employed in any other sense

[1]Read before the Section on Radiology at the Seventy-ninth Annual Session of the American Medical Association, Minneapolis, June 15, 1928. Reprinted by permission from the *Jour. Am. Med. Assn.*, Sept. 29, 1928, XCI. 960.

by any other group of individuals up to this time, nor do they seem likely to be in the future.)

3. The main objection to the terms "roentgenology" and "roentgenologist" is that they do not include or imply the use of radium or other radio-active substances. Moreover, "radiology" and the necessary derivatives of the prefix "radio" are more euphonious.

4. Under the term "radiology," as a subject or a branch of medicine, might still be retained or included the designations of a subgroup, "roentgenology" and "roentgenologist," to include those individuals who practise only the diagnostic application of roentgen rays as a specialty.

5. There are many individuals who practise only the therapeutic application of roentgen rays and radium. To conform with Recommendation 1, these persons could be designated as "radiotherapeutists" or "radiotherapists" and their line of work as "radiotherapy" or "irradiation therapy." There are practically no individuals who now employ either radium or roentgen rays to the exclusion of the other and remain specialists in this line of work. For example, many gynecologists use radium themselves, but they remain gynecologists. Few, if any, who employ roentgen rays in treatment as a specialty do so in these days without also using, themselves, or having recourse to the use of radium when appropriate occasions arise.

6. Nevertheless, the use of either agent alone must be designated as "roentgen therapy" or "radium therapy," respectively, for descriptive purposes or in defining or directing treatment.

7. The use of ultra-violet, infra-red or sun rays would be included under "radiotherapy" when an individual employs radium and roentgen rays in addition, but this term is not applicable to the use of ultra-violet, infra-red or sun rays alone to the exclusion of the other agents. We do not suggest any designation for the use of these rays alone, and, furthermore, there are few if any individuals who use them outside the practice of radiology except in connection with other branches of medicine.

8. "Fluoroscope" and "roentgenoscope" may be regarded as synonymous terms and the use of this device may be designated as either "fluoroscopy" or "roentgenoscopy." We regard it as an undesirable policy to eliminate the former term when common usage has made it correct.

9. We strongly recommend the use of the prefix "roentgen" in all connections with all direct references to the sole use of x-rays, with the exception as stated in Paragraph 8. The term "roentgenogram" is compulsory because that of "radiogram" is now employed to designate a message transmitted through space and should not be used in a medical sense. "Roentgenograph" should not be used as a noun as is "photograph," but it will probably have to be adopted as a verb to designate the examination of a patient by the making of roentgenograms. It is an undesirable word but the adoption of "radiograph" is unwise, first, because it conflicts with a standard nomenclature, and, secondly, because it is likely to be adopted in the future in connection with the radiotransmission of pictures. Other derivatives of the prefix "roentgen" would be "roentgen therapy" (Paragraph 6), "roentgenology" and "roentgenologist" (Paragraph 4) and "roentgen diagnosis."

10. The choice between "roentgenologic" and "roentgenological" seems to be largely a whim of editors, just as are "pathologic" and "pathological." We recommend the former when either is necessary as an adjective. As "roentgen therapy" is preferable to "roentgenologic therapy," so we prefer "roentgen diagnosis" to "roentgenologic diagnosis." As "roentgen" is being ad-

vised as a prefix, it seems unwise to combine "ray" with it. For example, "roentgen diagnosis" and "roentgen therapy" seem more logical than "roentgen-ray diagnosis" or "roentgen-ray therapy." Somewhat similarly, "roentgenologic aspect" seems preferable to "roentgen-ray aspect."

11. We recommend that the prefix "roentgen" be adapted to English spelling as here written. As has become customary with similar words derived from proper nouns, as "volt," "ampere," and "ohm," the prefix "roentgen" should not begin with a capital letter except as the first word in a sentence. Similarly, x-ray should begin with the small letter x. At the beginning of a sentence, x should be the capital letter as in any other hyphenated word.[2]

12. The terms "high voltage," "medium voltage," and "low voltage roentgen therapy" are preferable to "deep," "medium," and "superficial roentgen therapy."

13. The words "radiation" and "irradiation" are not synonymous. The former applies to the radiant energy emitted by the x-ray tube, and radium or other radio-active substances as well as some other sources. "Irradiation" refers to the application of these agents. For example, an x-ray tube radiates roentgen rays, and a radiologist employs the rays in the irradiation of a patient during treatment. The verb "irradiate" implies such application and should be limited to the therapeutic application, and not employed to designate the diagnostic use of roentgen rays.

14. Certain undesirable terms are fast coming into common use, mainly through those outside our specialties. Individuals who employ them constantly in conversation and requests are apt to apply them in their writings also; hence the habit should be discouraged. The word "x-ray" should not be used as a verb, as, for example, a request to "x-ray a patient." An examination after an operation is frequently designated as an "after ray."

15. The use of the word "x-ray" should, in a broad sense, be limited to its application to physical problems and to apparatus, as the "x-ray tube" and "x-ray apparatus." The latter term is applicable to the entire equipment, including the tube. The term "x-ray machine" is sometimes employed but is misleading. Strictly speaking, it applies to the transformer, rectifying switch, filament transformer, and controls. It is proper to speak of "x-ray waves" or impulses and not to use the prefix "roentgen."

16. The singular form (x-ray) should be used as an adjective, as, "x-ray tube," and the plural form (x-rays) as a noun to indicate the radiant energy emitted by the x-ray tube. One should never state, for example, that "the x-ray has many practical applications," but, rather, "x-rays have many practical applications."

17. There are certain preferable terms applicable to equipment. "Transformer" or "high potential" or "high tension transformer" are proper and synonymous terms. The term "generator" usually applies to a revolving piece of machinery driven by power and is not synonymous with "transformer."

18. Terms applicable to radium: "Milligram" and "milligram hours" are terms applicable to the use of the element. "Millicurie" and "millicurie hours" are terms applicable to the use of radon. "Radon" is the generally accepted term applicable to what was formerly called "radium emanation." "Seeds" was a term applied to small radon tubes used for permanent implantation but should be discarded. "Bare tubes" was a term applied to the small glass tubes used for this purpose and is not correctly descriptive and is not advisable; but, as glass implants are going out of use, the term will probably be dropped. "Implants"

[2]The style adopted by RADIOLOGY is to write this with a capital X.

should be applied to the small tubes containing radon which are embedded in tissues with the purpose of having them remain indefinitely. Gold or platinum or even glass "radon implants" are the terms recommended. Radium or radon needles are hollow pointed applicators containing the element or radon and intended for temporary embedding and subsequent removal.

Two applicators known as the radium or radon "pack" and "tray" are unfortunately designated by confusing terms. It would be wiser to use one of them, in lieu of a better term, and designate it by size and distance, as, for example, the large or the small, 10 cm. or 3 cm. pack.

RESOLUTIONS

The following Resolutions were adopted at a meeting of the Chicago Roentgen Society, Nov. 8, 1928, and amended and approved by the Council of the Chicago Roentgen Society.

WHEREAS, it is currently reported that efforts are being made to permit and to induce technicians to do fluoroscopy, and make fluoroscopic or roentgenoscopic examinations of patients, and

WHEREAS, it is recognized that fluoroscopy or roentgenoscopy requires a most thorough knowledge of physiological and pathological roentgenologic findings, along with a thorough knowledge of general medicine, and

WHEREAS, it is for the best interest of the public, and more particularly the patients who are in need of fluoroscopic or roentgenoscopic examinations that these examinations be made only by persons whose training and education properly fit them to make the same, therefore, be it

RESOLVED, by the Chicago Roentgen Society, that it is our unbiased opinion and judgment that fluoroscopic or roentgenoscopic examinations should be made by graduates in medicine only, and that no such examinations be made or permitted to be made by any technicians, except they be physicians, and it is further

RESOLVED, that the Council on Medical Education and Hospitals of the American Medical Association be hereby urgently requested to make it a requirement for approval for hospitals and roentgen laboratories, *that no technicians are permitted to make fluoroscopic or roentgenoscopic examinations,* and it is further

RESOLVED, that copies of these resolutions be sent to the Editors of RADIOLOGY, and the *American Journal of Roentgenology and Radium Therapy* and to the Secretary of the Chicago Medical Society for publication, and to the Council on Medical Education and Hospitals of the American Medical Association, and to the American College of Surgeons.

MEDICAL POLICY[1]

The Commission on Medical Policy has formulated the following statement of Medical Policy, which it submits to the Council of the Chicago Medical Society for consideration. The Commission will, from time to time, submit additional statements covering points not included at this time.

PREAMBLE

In order that the public may better understand the aspirations and ideals of the Medical Profession of Cook County, it seems advisable for the Chicago Medical Society, which is the Medical Society of Cook County, to issue a statement of Medical Policy to supplement the "Principles of

[1]Reprinted from *The Bulletin of the Chicago Medical Society,* Dec. 15, 1928, XXXI, 26.

Medical Ethics of the American Medical Association."

STATEMENT OF POLICY OF THE CHICAGO MEDICAL SOCIETY

1. The Chicago Medical Society accepts the principle that its members are ready and willing to serve all citizens of Cook County, irrespective of their economic status.

2. Medical education and the practice of medicine in all its branches should be controlled by Doctors of Medicine.

3. Medical schools, private, endowed, or government hospitals, tax-supported institutions or departments should not enter upon the practice of medicine in competition with those in private practice.

4. The principles underlying the graduated fee and full fee clinics are economically unsound and fundamentally wrong, whether these clinics are conducted by individuals, endowed institutions, by institutions incorporated for profit or by institutions incorporated not for profit.

Dispensaries or free clinics, whether conducted by government or by welfare or other organization, should in each instance have a Medical Board composed of physicians who are members of the Chicago Medical Society.

The members of the faculties of the medical schools and of the medical boards and staff of the governmental or other organizations conducting dispensaries or free clinics shall be held responsible for the conduct of the activities of its organization in accordance with the Statements of Medical Policy of the Chicago Medical Society and the Principles of Medical Ethics of the American Medical Association.

5. The institutions, sanatoria, and hospitals in Cook County that are supported by taxation, should admit as charity patients, except in emergencies, only those referred by physicians or found worthy of free medical service.

6. All physicians employed in tax-supported departments, hospitals, sanatoria, or institutions, whether on full or part time basis, should be adequately remunerated for the medical service rendered.

7. Free clinics and dispensaries should refuse, except in emergencies, all patients not referred by physicians except those found worthy of free medical service.

8. The words *clinic, institute, academy, cardiac therapy, gastro-intestinal therapy,* and the like, are misleading and improper when applied to groups or organizations of physicians engaged in any or all of the branches of the practice of medicine. The proper designation of such groups or organizations is the name of one or more of those active in its formation, plus a phrase describing its scope.

9. The rules and regulations of the American Medical Association for clinical laboratories have been adopted by the Chicago Medical Society and have been applied by it to X-ray laboratories, with the provision that the use of X-ray apparatus for the purpose of arriving at a diagnosis or for therapy in any given case be considered as the practice of medicine; therefore the same regulations should apply to X-ray laboratories with the following modifications:

"Every X-ray laboratory should be in charge and under the direction of a duly qualified physician who is licensed under the laws of this State to diagnose and treat diseases, and should be qualified to operate and use an X-ray machine."

DR. PRESTON M. HICKEY CLUB

This is not another X-ray society, but an informal group—hardly an organization—of the men who have trained under Dr. Hickey at the University of Michigan

X-ray Department. The idea is to keep in touch with one another and to have informal reunions when any of the group join their associates during the meetings of any of the radiological societies. The first such affair was a luncheon attended by twelve, during the Annual Meeting of the Radiological Society of North America, in December, at the Drake Hotel, Chicago. Dr. Hickey himself was the Guest of Honor, and the occasion was such a happy one for all those present that they wish to perpetuate the plan and to add to their group all men who have been associated under Dr. Hickey. If any such, who was not present at Chicago, reading this notice, wishes to ally himself with his former associates, the only formality asked of him is to write to Dr. S. W. Donaldson, at St. Joseph's Mercy Hospital, Ann Arbor, Michigan.

Next Spring, when the American Medical Association meets in Portland, a number of radiologists will be attending the Section on Radiology and the convocation of the College of Radiology, and it is more than likely that the Dr. Preston M. Hickey Club will be able to muster a group in happy reunion.

THE SCIENTIFIC EXHIBIT

At the Annual Meeting, Dec. 3-7, at Chicago, there were on view the following exhibits:

Dr. Alden Williams, Grand Rapids, Mich.
"Superficial Malignancies."

Dr. E. D. Crutchfield, San Antonio, Texas.
"Experimental Studies on Effects of Combined Irradiation with X-ray and Ultraviolet Light."

Dr. Henry Schmitz, Dr. Herbert E. Schmitz, Dr. Joseph E. F. Laibe, Chicago, Ill.
"Studies in Hysterography and Pyelography."

Dr. Samuel Brown, Cincinnati, Ohio.
"Clinical Radiology of Diseases of the Thorax."

Dr. W. W. Watkins and Dr. H. P. Mills, Phoenix, Ariz.
"Bronchiectasis" and "Pneumoconiosis."

Dr. Harold Swanberg, Quincy, Ill.
"Radium Treatment of Cervical Cancer (Regaud Technic)."

Dr. D. T. Quigley, Omaha, Neb.
"Radium Therapy."

Dr. Richard Hayes, Longview, Wash.
"Intermittent Duodenal Stenosis."

Mayo Clinic, Rochester, Minn.
"Library Exhibit of Films of Outstanding Interest."

Dr. Henry K. Pancoast, Dr. Karl Kornblum and Dr. James Gardner, Philadelphia, Pa.
"Encephalography."

Dr. Daniel N. Eisendrath and Dr. Robert A. Arens, Chicago, Ill.
"Urological Roentgenology."

Dr. Irving F. Stein and Dr. Robert A. Arens, Chicago, Ill.
"Gynecologic Radiography."

J. L. Weatherwax, M.A., and Dr. Bernard P. Widmann, Philadelphia, Pa.
"Physical Principles of Radiation Therapy and Their Clinical Application."

Dr. David Steel, Cleveland, Ohio.
"Heart Lesions"—Correlation of Roentgenological and Pathological Findings.

Dr. Eben J. Carey, Milwaukee, Wis.
"The Dynamics of Bone."

Dr. W. Walter Wasson, Denver, Colo.
"When Does Sinus Infection Begin?"

Dr. Emil J. Beck, Chicago, Ill.
"Stereoscopic and Colored Plate Photography of Malignancies Illustrating the Open Method Operation."

Dr. Webster W. Belden, New York, N. Y.
"Differential Diagnosis."

Northwestern University Medical School,
DR. W. T. BRONSON, Chicago, Ill.
"Soft-tissue Differentiation."

THE COMMERCIAL EXHIBIT

"Better than ever" was the general comment of visitors and exhibitors at the Fourteenth Annual Meeting of the Society in Chicago. The Drake Hotel's grand dining salon was divided up among the 27 exhibitors, and, since the lighting and location were well-nigh ideal, every one was pleased. On Monday morning when the meeting opened the exhibits were well along toward completion, thanks to the Sunday work of the committee and the mechanical staffs. A stroll about revealed the apparatus, etc., shown to be somewhat as follows:

The display of the Abbott Laboratories was centered about Chole-Cysto-Col, a new medium for gall-bladder radiography. Chole-Cysto-Col presents tetraiodophenolphthalein in the form of a stable milk-white colloid, which, for administration, requires merely the addition of water. The representative in charge of this, the first exhibit of this company with the Society, explained that, precipitation being prevented by the presence of an effective protective colloid, the product passes through the stomach unchanged. In the intestine, the colloidal state of division insures rapid and complete solution. Because of these facts, two grams of dye are said to give excellent shadows in a minimum time. Nausea and laxative action are seldom encountered, it is claimed.

Two other products from the extensive Abbott line were featured, Sunex and Butesin Picrate Ointment. The former is a cream containing a non-toxic organic chemical which is opaque to ultra-violet light. Applied to areas adjacent to those receiving light treatment, it is said to effectively prevent burns. Butesin Picrate Ointment combines the anesthetic effect of Butesin with the antiseptic action of picric acid. Applied to burns or abrasions, its makers claim that it eliminates pain and aids in preventing infection.

The Acme-International X-Ray Company exhibited their new Universal Motor-driven Radiographic and Fluoroscopic Buck Tilt Table, Bullitt's Mastoid Device, the new No. 5 Horizontal Radiographic and Fluoroscopic Bucky Table, the "Six-Sixty-Plus" and 150 K.V. Super-High-Speed Coronaless Roentgen Generators, equipped with sanitary base, 100 Point Auto-transformer Control, Micro Timer and Breaker, Horizontal Motor-driven Stereograph, Deep Therapy Protective Cylinder and Treatment Table, Water-oil-water Deep Therapy Cooling System, Model IV Diathermy Generator, ultra-violet lamps, and an assortment of accessory and supply items.

The exhibition of radiographs attracted much attention and was ably demonstrated by Mr. Harold Petsing, Educational Director.

Geo. W. Brady & Company exhibited many interesting accessories, including a Braasch-Bumpus G. U. Table, with Curved Style Bucky Diaphragm, their line of Curved and Flat Top Potter-Bucky Diaphragms, both the Curved and Flat style of Fluoroscopic Bucky, Furstenau Intensimeter for measurement of treatment dosage, and a steel illuminator with mercury arc illumination that was voted the best illuminator on the floor.

Owing to the marked interest shown in the Metalix type tubes, on which a paper was read by Dr. Albert Bouwers, of Eindhoven, Holland, during the meeting, they also showed the radiator style and water-cooled styles Metalix tubes, which were of great interest to many who had previously only seen pictures of them. Mr. Brady also

showed a new line of acid- and corrosion-proof developing tanks, and the regular line of soapstone and enamel tanks.

Britesun, Inc., of Chicago, exhibited their line of therapeutic ultra-violet arc lamps, for use with alternating or direct current. These lamps are of a variety of styles, ranging in price from moderate single arcs to the highest type of double arc, higher amperage, automatic, therapeutic ultra-violet generators.

The exhibit of the Buck X-Ograph Company contained several new and interesting items besides their usual exhibit of Silver Brand Film, X-Ograph Dental Film Packets, screens, and cassettes.

A new type of illuminator, mounted in series and adjustable to any angle from vertical to horizontal, was shown, also a low-priced developing tank for the small laboratory.

Probably the most outstanding feature of the Buck Exhibit was a Dark Room Unit, consisting of a film dryer with side pull drawers and linoleum-covered top, above which is located a cabinet containing metal-lined film bins—an entirely new departure from the old loading shelf and storage box for films. It is claimed for this Unit that it not only offers decided economy in floor space, but that it is an added convenience to the dark room. It seemed to attract considerable attention, for it promised to be useful to those doctors interested in a clean, orderly, and efficient X-ray dark room.

The Buck Company also distributed copies of a new booklet, called "The Buck X-ray Dark Room," pertaining to the design, construction, and equipment of the laboratory and hospital dark room.

Cameron's Electro-diagnostic and Operating Equipment would seem to put light at the very fingertips of the physician and surgeon in all of the orifices of the body and through surgical incision. The demonstration of this equipment and the technic of using it attracted unusual interest in all who witnessed it. Not all physicians realize the vast improvement in surgical technic made possible by adequate light. One of the greatest difficulties in the practice of medicine is light deficiency—the physician and surgeon can never get enough. Perhaps the best evidence of this is the great number of operating lamp fixtures, many of which are clumsy and hot, in the offices to-day.

An exhibit well worth noting was that of the Chicago X-ray Film and Mount Company, specialists in the manufacture of films and two practical types of dental X-ray film mounts, together with envelopes to fit.

The films, exactly the same as any other high grade film on the market so far as film itself is concerned, differ only in the wrapping, which is square-cornered instead of round. This is easily overcome by merely bending the corners slightly before inserting in the patient's mouth, making the film equally as comfortable as any other, and saving the doctor considerable on the purchase price.

The one type of mount, all-celluloid, with small die-cut clips for holding the films, was shown in the popular frosted finish and also in opaline, a milky white finish rarely used. A few mounts had borders, either the hair-line, the usual medium border, or the rope effect, for covering the white margin showing on some films. The other type, cardboard with frosted, opaline, or clear celluloid attached to form the backing for the die-cut windows, was shown in gray and black. In each type there were shown mounts for holding one to fourteen exposures, arranged horizontally or vertically, and the full-mouth mounts such as can be supplied in all the popular combinations of the horizontal and vertical positions, with

corresponding half-mouth mounts. In addition to the complete line of mounts for holding the regular size films, there were also shown those for molar, bite-wing, and other special size films. The attention to detail and the neatness of the printing added considerably to the attractive appearance. Several special mounts, out of the ordinary in regard to arrangement, size, and number of the windows, completed the well-arranged exhibit.

The firm of Cooper and Cooper, Inc., with Mr. Leon Cooper and Mr. Harry Wolf of New York, and Mr. C. W. Smith of the Philadelphia branch present, exhibited an extensive line of accessories, amongst them being their C. and C. Drying Cabinet and their C. and C. Diagnostic Cabinet, equipped with Cooper-Hewitt lights, mounted on three 2-drawer filing cabinets, the whole making a compact unit for filing and illuminating.

Likewise there was a display of tanks of various sizes for private and institutional installations, and suggestive models of specially constructed tanks recently installed in several hospitals. A new vertical cassette holder, of all-metal construction on the principle of counterweight balance, was shown. Other items consisted of protective materials, screens, cassettes, radiopaque salts, films, hangers, and other items.

Davies, Rose & Co., Ltd., were glad of the opportunity of demonstrating their preparation for the oral administration of sodium tetraiodophenolphthalein, called Shadocol. Their representatives, Mr. R. J. Mansfield, of the Research Department, and Mr. H. N. Fleming, explained that it is the result of four years of continuous research, begun in 1924 when their chemists were invited to co-operate with Dr. Whitaker, Dr. Milliken, and Dr. Vogt.

Shadocol, the firm claims, is the original "mix with water and stir until white" form, which converts the salt into a finely divided precipitate of the dye, the magma passing through the stomach unchanged, but dissolving in the alkaline intestinal fluid, after which it is absorbed by the intestine, excreted by the liver in the bile, and concentrated by the gall bladder. Mr. Mansfield's demonstration of the changing of the blue sodium salt to a milk-white magma of tetraiodophenolphthalein created much interest among the visitors.

The Eastman Kodak booth was divided into three main sections. As at former meetings, the medical motion pictures proved of extreme interest and some really excellent photography was shown. Marked interest was shown in the exhibition of roentgenograms made on the company's new Dupli-Tized Contrast Film. Plates of osseous structure as well as gastro-intestinal radiographs would seem to indicate that this newcomer in the field of radiographic materials is quite remarkable in its adaptability to different conditions. The third portion of the exhibit was given over to methods and materials of processing X-ray and photographic films, and the Eastman X-ray Illuminators for viewing X-ray films for interpretation. While much of this material is standardized, and has been for some time, numerous minor improvements were noticed, which attendants in the booth explained were to increase the longevity of the material or equipment, or make it more trouble-free.

An unusual degree of interest was shown in the several new types of equipment displayed by the Engeln Electric Company, the Self-contained SimpleX Unit for office radiography and the Self-contained DupleX Unit, which has, in addition, a fluoroscope attachment. These units incorporate new features of construction and operation. The All-metal Unit Construction Dark Room

was also a new and interesting display. The Non-tilt Bucky Radiographic and Fluoroscopic Table was shown in combination with a 5-inch, 30-milliampere transformer mounted in a special housing at the head of the table. This transformer included the new oil-immersed high tension switch which has made possible the elimination of aerial in many of the latest types of Engeln installation.

A Motor-driven Tilt Fluoroscopic Table was also shown by Mr. Engeln. The transformers which he showed embodied a number of interesting features. The kenotron rectifier, used with the 107,000 volt transformer, is immersed in the oil of the transformer tank, while new and improved types of synchronous motors and double disc mechanical rectifiers eliminate almost entirely the usual phasing-in difficulties experienced with this type of equipment and reduce the noise to an absolute minimum. Remote control units include a complete meter scale standardization and adjustment, a pre-reading filament indicator, and an entirely new and improved type of switches throughout. Complete terminal boards carry all electrical connections to a convenient and easily accessible panel.

The Engeln Stabilizer, a complete line of tube stands, the vertical cassette changer, and the vertical fluoroscope were among the features of the exhibit which attracted interested observers.

The French Screen Company, of Detroit, Michigan, had an interesting exhibit of some of their screens which had been in service for seven years. As explained by their representative, this long life was made possible by the Removable Protective Covering.

The General X-ray Company, of Boston, had on exhibition a Morse Wave Generator and several new and improved electrodes. This Morse Wave Generator produces the low volt currents as used in physiotherapy, sine wave and galvanic. The sine wave current is used in producing exercise of any muscle or group of muscles in the body, either voluntary or involuntary. The galvanic current is useful in many conditions. The Morse Wave Generator attracted much interest.

At the exhibit of the Hanovia Chemical & Manufacturing Company we always renew pleasant acquaintance with old and honored friends, and feel inspired and stimulated by contact with the enthusiasm and spirit of this organization; as originators and pioneers, these men are justified in taking pride in their work.

The Alpine Sun and Kromayer quartz lamps were introduced to the medical profession many years ago, and for a decade or more offered the only evidence that light therapy was destined to be anything but a transient dream. Therefore, it is worth more than passing notice that these modalities in new dress, together with the new additions to Hanovia's family, namely, the Luxor and Sollux models, are now manufactured in six different countries of the world.

A glance at *The Quartz Lamp*, published monthly for Hanovia by the Alpine Press, Inc., Newark, N. J., creates a unique impression—it deals with ultra-violet only—no illustrations—no advertising—no brief in favor of Hanovia products—only articles (and abstracts) written by physicians who use some form of this energy in their practice. Thereto is added a bibliography for further information.

Upon visiting the Hanovia exhibit one received a cordial invitation—understood to include any member of the Society—to visit this company's laboratories and factories at Newark, N. J., or the main branch office of

Hanovia at 30 North Michigan Avenue, Chicago. At either of these places there is a welcome at all times for friends, customers, and those who may be interested in discussing quartz light.

Horlick's Malted Milk Corporation, of Racine, Wis., was again among exhibitors this year, greeted by the users of "Horlick's" as a suspension medium in preparing the contrast meal with barium sulphate. The Horlick representatives assured their visitors that Horlick's Malted Milk fulfills the requirements of a shadow meal in that it is (*a*) easily and quickly prepared, (*b*) is easy for the patient to take on account of its palatability, and (*c*) does not over-stimulate or restrict normal gastric secretions.

The Dumore Electric Mixer, featured as an adjunct to the use of malted milk in preparing barium sulphate for X-ray diagnosis, operates on either direct or alternating current, and does anything required of the larger and more costly mixers, such familiar sights at fountains.

As in former years, the Kelley-Koett Mfg. Co., of Covington, Ky., was represented by an exhibit of developments in X-ray apparatus, designed to anticipate radiographic requirements for the ever-advancing methods and technics employed in "new day" radiography.

Roentgenologists visiting the Keleket exhibit centered their attention on the new 150 Peak Kilovolt X-ray Apparatus. This new addition to the line of "Power Plus" generators consists of a remote Control Cabinet and a new, improved "Power Plus" Double Disc Rectifier. The control of the apparatus introduces several innovational features, for each of which the designers claim practical value in simplifying operating procedures. The Rectifier is firmly mounted on the high tension transformer and is built for heavy duty so that currents of either large or small volume may be delivered to the tube. The transformer is oil-immersed and enclosed in a metal tank. All edges of this unit are rounded, a point which is thought to add not only to its heavy-duty construction, but to its beautiful appearance as well.

Along with the 150 Peak Kilovolt Apparatus a new 100 Peak Kilovolt X-ray Apparatus was shown. The Rectifier of the 100 Peak Kilovolt Apparatus resembled the 150 Peak Kilovolt Rectifier in all respects except that it was built on a smaller scale. Likewise, the control of the 100 Peak Kilovolt Apparatus incorporated many of the operating conveniences of the "150" in a more modified unit, making the complete apparatus a small yet powerful unit for ultra-fast radiography and fluoroscopy.

Another new X-ray accessory shown for the first time was the new Head Apparatus, consisting of a Keleket Head Bucky and Tube Arm, so arranged as to have the entire assembly mounted on a counterbalanced stand, enabling the operator to shift both the tube and the cassette. In this way he is able to conform to any height and at the same time to make it possible to rotate the tube and cassette so as to bear a perpendicular relationship to the position of the patient. These features enable one to radiograph various parts of the head in both the anterior-posterior and lateral positions. All of the adjusting elements are provided with scales marked directly in degrees.

The new Dental Tube Arm, mounted on a counterbalanced wall mounting, also attracted much attention. Attention was called to the ease with which any tube angle may be obtained and the universal application of the device in that it may be attached to a tube stand or mounted on a wall.

The Keleket Diagnostic Table, it was pointed out, introduced a new flat top table

for radiography and horizontal fluoroscopy, incorporating a Keleket 17 × 17 flat Potter diaphragm, a rail-mounted tube stand for radiography, and a fluoroscopic unit, with screen for fluoroscopy.

One of the most interesting products featured was the combination tube and cassette changer—an X-ray accessory used in stereoscopic heart and chest radiography. This equipment consists of a pendulum cassette changer and an especially designed tube stand, embodying an automatic tube shifting and re-setting mechanism. These two pieces are so arranged as to operate coherently with one another. The tube is at all times centered on the cassettes in the changer.

A Synchronous Impulse Timer, usually used in connection with the beforementioned equipment when fast chest or stomach radiography is performed, was also on exhibition. It provides absolutely accurate time exposures ranging from one-twentieth of a second to one-fourth of a second.

A new Angulating Head Tunnel, especially designed to accommodate a Granger Mastoid Localizer, introduced an X-ray accessory whereby mastoids may be radiographed with the patient lying on his back. Radiographs taken with this instrument are said not only to show clearly all the landmarks and structures, but the difference between the extremity of the interior maxilla and the mastoid process is said to be greater and the possibility of their shadows overlapping to be lessened.

Another new development was the Tube Arm on the Keleket Bedside Unit. This new arm permits the apparatus to be used for all forms of radiographic work. The tube, supported by the arm, is universally adjustable to any angle. It can even be turned upside down and placed under stretchers for emergency work. The Keleket Bedside Unit, incorporating the new Tube Arm, presented a complete X-ray apparatus—the control, high tension transformer, and tube stand all mounted on ball-bearing wheels so arranged as to take up the minimum amount of floor space. The unit can be moved with surprising ease.

The Keleket Improved Stabilizing Unit, designed especially to maintain a steady and constant voltage supply to the filament circuit, subsequently assuring a uniform filament heat and steady quantity of electronic emission at the X-ray tube, was demonstrated.

In addition to several other major pieces of X-ray apparatus, a representative line of Keleket X-ray accessories and dark room equipment was displayed on an exhibition board for convenient observation.

The Medical Protective Company, whose representatives engaged visitors in conversation at one booth, based its arguments on the following points: Self-preservation being the first law of Nature, the greater the dangers to be encountered, the greater the protection necessary to effectively meet them.

Statistics invariably indicate a higher per-capita malpractice suit record and a higher judgment "mortality" in the field of radiology than in any other professional specialty. Furthermore, what might be termed "catastrophe possibilities" must be given greater consideration here than elsewhere. Self-preservation can best be assured that radiologist who makes protection in all of its phases the primary consideration—price, the secondary; who insists that he be covered for *all* professional services rendered by himself or by any other person; who desires protection not only from the usual charges of malpractice but from allegations of any breach of professional duty whatever; who takes advantage of the latest advance in professional protection covering not only defense but also full indemnity for

all return of fee cases—sometimes misnamed "breach of contract" cases; who prefers a company that by specialized application is as highly trained in professional protection as he is in his profession.

The Middlewest Instrument Company, of 1870 Ogden Avenue, Chicago, displayed their new Jones Basal, a metabolism apparatus designed with the idea of combining all the usual accessories—the stand, barometer, oxygen tank, breathing connections and the instrument itself, all in one solidly combined unit, instead of providing these as separate pieces of equipment. Freedom from calculation was shown as an unique feature of the instrument, and its easy portability by means of a small carrying case was demonstrated.

The Company also introduced, as new, the method used in this instrument for doing away with the need for water or any kind of fluids in the apparatus.

The National Aniline and Chemical Co., Inc., of New York, showed their Tetradol Emulsion, a new dosage form for the oral administration of tetraiodophenolphthalein sodium salt, for which the following points of excellence and adaptability are claimed: (1) That the dye may be administered in a single dose; (2) That there results a marked diminution of nausea and unpleasant reaction; (3) That it may be rendered palatable in fruit juice; (4) That the emulsion is stable and does not deteriorate if kept sealed; (5) That the dye thus administered is in a freshly precipitated form, readily available for absorption. It is marketed only in single-dose containers, each bottle containing 4 grams of dye.

The Patterson Screen Company occupied a space and there exhibited Patterson Cleanable Intensifying Screens, Patterson Fluoroscopic Screens, and the Patterson Fluoroscopic Specialties. Mr. Patterson and Mr. Reuter, of this company, were in attendance, explaining technical problems of screen manufacture and greeting their many friends among the members of the Society.

An exhibit which, as usual, attracted more than an ordinary amount of attention was that of the Picker X-ray Corporation, whose main office is in New York City, with branches in Buffalo and Boston. This concern exhibited a varied assortment of modern equipment and accessories. Visitors were especially attracted to a display of specialties which have been produced by this concern during the past year for gall-bladder, gastro-intestinal, and colon examinations. These preparations consist of Kerasol (in capsule form), Keraphen, a powder to be dissolved in water, and Basolac, a prepared barium meal. Each of these products is the creation of James Picker, who has made an exhaustive study of X-ray requirements and has pioneered in the products used by the profession.

Another attractive feature of the exhibit was a display of the new Foley Cystourography Table. This table was designed by Dr. Frederick E. B. Foley, Chief Urologist of Ancker Hospital, St. Paul, Minn., for use in cystoscopy and urography. It is entirely motor-operated and all changes in position are effected by electro-hydraulic piston and cylinder units. These are operated by oil supplied by a gear pump driven by an electric motor and controlled through foot pedals by the operator. An auxiliary set of controls, worked by hand levers, is placed at the side of the table for use during pyelography. All this mechanism is placed in a covered compartment across the back of the base, which affords quiet operation. The X-ray tube stand is an integral part of the table and moves with it for all changes of position. The steel post uprights

of this stand are so firmly attached to the table that no vibration whatever occurs even when the table is in motion. The actual tube carrier is mounted on a frame which can be tilted up into vertical position well out of the way during cystoscopy, and tracks on this frame are provided for longitudinal shift of the tube for all sections to be brought under the X-ray. One of the distinctive features of the Foley Cystourography Table is that it permits making pyelo-ureterograms in the fully erect standing position.

The Radiographscope Company, of Greensboro, N. C., showed their Radiographic Angle Head Table and their Calibrated Marker and Cover. The marker is used to register positions and angles of target, patient, and cassette. Its use enables the operator to "blue-print" his technic, a valuable point when making duplicates, records, or retakes. They also showed their Radiographscope, which enables the radiologist to view stereoroentgenograms from different angles.

The Standard X-ray Company had on exhibit a new motor-driven radiographic and fluoroscopic Bucky table, which attracted considerable interest. This table, in conjunction with the newly developed magnetically operated Stereoscopic Tube Stand, is said to offer an ease and flexibility of operation not previously obtainable. Another motor-driven table, for fluoroscopic work only, was also exhibited.

A small portable sphere gap for the calibration of radiographic machines was shown.

This Company had a centrally located space and many of the well known "Standard men" were in attendance.

The Swan-Myers Company, of Indianapolis, showed gall-bladder dye in two forms—Iodeikon Capsules and Iodeikon Emulsion (desiccated), the latter prepared for the use of those roentgenologists who wish to give at one dose a sufficient quantity of the freshly precipitated free acid, tetraiodophenolphthalein, for shadowing the gall bladder. Each dose is packed in an individual half-ounce vial, with complete directions attached. The Capsules contain 0.25 gm. of Iodeikon (tetraiodophenolphthalein sodium), manufactured by the Mallinckrodt Chemical Works. There was abundant literature for distribution, giving accurate directions for the administration of the dye.

Outstanding among the several interesting features of the Victor X-ray Corporation exhibit was an electrically safe X-ray apparatus, said to be the first of its kind to be designed for medical work. While it has been the opinion of some authorities that an X-ray apparatus absolutely safe from electrical shock was practically impossible, this group of engineers believe they have brought it to a reality. It has been made possible by immersing both the high tension transformer and the Coolidge tube in oil in the same sealed container, which is manipulated in much the same way as the tube carriage on the ordinary tube stand.

Because of the complete insulation from high tension current, some radical departures in design have become possible with the balance of the X-ray outfit. The result is an increased flexibility and range, even so far as permitting radiographic positions hitherto not permissible because of the proximity of the high tension current. The extent of this increased flexibility may be better understood when it is said that the tube is positioned to the patient rather than the patient to the tube, even to the radiography of the body laterally. This feature should prove especially valuable in the handling of accident cases, where the com-

fort of the patient is so essential. Again, such an outfit will undoubtedly serve to relieve the operator from the strain of watching children and other nervous patients on the X-ray table, lest they come in contact with the high tension system.

The Coolidge tube especially designed for this outfit has a rating of 30 ma. at 85 K.V.P., thus offering a complete radiographic service within the range of this capacity.

Occupying an unusually small floor space, this outfit offers the complete radiographic range, with and without Bucky diaphragm, as well as fluoroscopy, both horizontal and vertical. The one tube serves all purposes, its mounting permitting it to be swung over or under the table as required. All overhead wiring or tubing is obviously eliminated.

From the fact that the self-rectifying tube and the transformer are immersed in oil, silent operation is realized. For the same reason the outfit operates uniformly at all altitudes and is not affected by extremes in humidity.

The Victoreen Instrument Company, of Cleveland, showed the New Fricke-Glasser X-ray Dosimeter, which, it would appear, is a practical clinical dosage instrument designed to aid the roentgenologist who is not himself a physicist to attain uniformity of output from his tubes. The Victoreen Dosimeter is an American-made instrument, calibrated in the *r*-unit, so that its dose may be repeated with absolute exactness.

The Waite & Bartlett Mfg. Co., of New York City, exhibited the following apparatus: New Oil-immersed 280,000-volt Deep Therapy Apparatus; New Model All-metal Fluoroscope; New Model 5-30 Oil-immersed X-ray Unit mounted on counterbalanced stand.

This Company is a newcomer to the Society's exhibit, and its apparatus was viewed with interest.

The Wappler Electric Company exhibited several new types of apparatus for the first time. Among these were the Wappler Quadrex Valve Tube X-ray Apparatus, the new Wappler Vertical Cassette Changer, and a Hand Stereoscope.

The Wappler Quadrex is a four valve tube apparatus delivering heavy milliamperage and designed particularly for ultra-rapid radiographic exposures. Several unique features were noted in connection with the control.

The new Vertical Cassette Changer was remarkable because of the unusually small amount of floor space required and its quickness and silence of operation.

The Hand Stereoscope, as its name indicates, is a compact little device which provides facilities for the stereoscopic viewing of films, mounted in ordinary viewing boxes, placed on any convenient table. An additional feature is the fact that as many as four observers may view a pair of films simultaneously.

In addition, several other standard items of Wappler Equipment were shown, including the Monex Valve Tube X-ray Apparatus, the Wyeth Endotherm, and the Wappler Portable Endotherm—high frequency surgical apparatus.

BOOK REVIEWS

MODERN X-RAY TECHNIC, By EDWARD C. JERMAN. Bruce Publishing Company, Saint Paul, 1928. Price, $5.50.

This book, written especially for X-ray technicians, is comprehensive enough to be a worthy addition to the library of any roentgenologist, and as a means of ad-

vancing X-ray technic to a higher standard, it is a worthy contribution.

The first part of the book deals largely with the essentials required in securing good roentgenograms, and a brief review of the advancements in X-ray technic. There are also special chapters on the Sphere Gap, Calibration, Potter-Bucky Diaphragm, Stereoscope, Fluoroscope, Construction and Operation of the Coolidge Tube, Dark Room Procedure, X-ray Physics and Protection as Applied to Routine Work in an X-ray Laboratory.

Chapter XIV, on Distortion, Detail, Contrast, and Radiographic Density, should be read by all who are interested in securing good X-ray films. The Regional Technic Charts should be of especial interest to those physicians doing occasional X-ray work in their office, as the correct position for taking practically all routine roentgenograms is illustrated.

A Short History of Medicine, Introducing Medical Principles to Students and Non-medical Readers. By Charles Singer, M.A., M.D., D.Litt., Lecturer on the History of Medicine in the University of London. Cloth. Price, $3. Pages 368, with 142 illustrations. Oxford University Press, New York, 1928.

This is a survey of medical progress from the days of Hippocrates, who has been called the Father of Medicine, down to the present, and is written for the general reader as well as the medical student. To anyone connected in any way with the medical profession Dr. Singer's book will be as valuable as it is entertaining. Between its covers is assembled a vast amount of interesting historical information available nowhere else in so compact and readable a form. A wealth of illustrative material graphically depicting the advances of science through the centuries contributes to the interest attaching to the book.

Dr. Singer is a Fellow of the Royal College of Physicians of London and lecturer on the history of medicine in the University of London. He is the author of a number of other books on medical subjects.

The *Journal of the American Medical Association* says of this book: "It is the best one-volume short popular history of medicine thus far available in English."

Materialeinsammlung der Unfalle und Schaden in Rontgenbetrieben. Zweites Heft. By Franz M. Groedel, Hans Liniger, and Heinz Lossen. Pages 119, paper. Published by Georg Thieme, Leipzig, 1927. Price 11 marks.

This is a complete summary and critical review of 101 new personal and reported cases of injury of patients sustained in or as a result of various roentgenologic procedures. Among ninety-five acute injuries studied there were forty-four due to unavoidable accident, twenty-five due to carelessness, and twenty-six due to ignorance. Thirty-two cases of injury resulted from diagnostic and fifty-nine from therapeutic procedures. It is interesting to note that twenty-three cases of injury were produced by technical experts, and thirty-eight by those without special training. Two cases of death were due to pure accident, carelessness accounted for one, and ignorance caused seven fatalities.

The subject matter, which is concisely presented, does not lend itself well to abstracting. Following the cases histories are a discussion of acute and chronic roentgen burns, the contra-indications to radiation, the end-results of late effects, and the criteria by which roentgen accidents and in-

juries should be evaluated. The book concludes with the rules of the German Roentgen Society concerning the clinical applications of roentgen rays. Such a volume as this will do much to encourage scientific roentgenology.

ABSTRACTS OF CURRENT LITERATURE

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On the Physiological Action of Ultra-violet Rays. A. Loewy. Strahlentherapie, 1928, XXIX, 333.

Careful clinical investigations did not reveal changes in the metabolism, the breathing, or the pulse rate following exposure to ultra-violet rays. These findings are at variance with the findings of Kestner and his co-workers.

E. A. POHLE, M.D., PH.D.

Gastrocolic Fistula. W. H. Dickson. Can. Med. Assn. Jour., March, 1928, XVIII, 272.

The two cardinal symptoms of gastrocolic fistula are fecal vomiting and lienteric diarrhea, symptoms which are grafted on to the symptoms of the pre-existing disease, of which gastrocolic fistula is a complication. Hence the diagnosis, from symptoms alone, is very difficult. The radiological examination is of the highest value. By this method the primary disease may be demonstrated and the exact site of the fistula may be established. In only one of the four cases reported was the lesion suspected before the radiological examination was carried out. Both the barium meal and the barium enema should be em-

ployed. The enema will, in a certain number of cases, be observed flowing through the fistula into the stomach, but none of the meal passes directly into the colon, on account of the fistula being of a valvular type. Six cases are reported and illustrated.

L. J. CARTER, M.D.

The Percussion of the Heart Borders and the Roentgen-ray Shadow of the Heart: A Study of 100 Cases. Chester M. Kurtz and Paul D. White. Am. Jour. Med. Sci., August, 1928, CLXXVI, 181.

The authors carefully compared the measurements of the heart in 100 cases by percussion with that obtained by teleoroentgenography. They found the results by percussion to be fairly accurate. They also found that the apex beat is not so accurate as the left border of dullness but is easier to demonstrate. They recommend that special attention be paid to the second interspace, as that may be the only portion where enlargement results.

ROBERT A. ARENS, M.D.

Radiation Treatment of Glioma of the Brain. George H. Hyslop and Maurice Lenz. Am. Jour. Med. Sci., July, 1928, CLXXVI, 42.

In glioma of the brain, two avenues of approach may be used for bringing the desired radiation to the tumor. Small capillary needles or points containing radon or radium may be inserted directly into the tumor mass through a craniotomy wound, and several successful cases have been reported following the use of this method. The problem is difficult, however, in infiltrating growths, and the second method of approach, by radiation through the scalp and skull, is preferable. Either roentgen rays or radium may be used. In the case of roentgen rays, the glioma should be cross-fired by rays of high penetrating power. Experimental work showed that it was not necessary to remove a portion of the skull when high voltage rays are used, and that increasing the focal distance beyond 30 or 40 cm. is not advisable, as the increase in depth dosage delivered 10 cm. from the surface is not sufficient to justify the increased time necessary. Where intermediate roentgen-ray voltage is employed, one-third of the surface dose may be absorbed by the skull. High voltage roentgen radiation is slightly more desirable than the radium pack at 6 cm. distance for lesions farther than 5 cm. from the surface.

Beneficial results are of sufficient degree and frequency to warrant the application of this treatment. Of 19 verified cases of glioma of the brain, 8 showed some degree of benefit and 2 others were possibly helped. It is desirable to deliver the maximum dosage within four to five weeks after institution of the radiotherapy. The dose to be given should be based on the size, location, and depth of the tumor. It is possible to cause unpleasant and even dangerous reactions through edema of the brain by too large doses given at one time.

Excellent tabulations and history protocols are given of the 19 cases reported.

W. WARNER WATKINS, M.D.

Ultra-violet Transmitting Glass. C. Dorno. Strahlentherapie, 1928, XXIX, 20.

The author discusses first the changes of the ultra-violet emission of the sun during the various seasons; it changes so much more than the total emission. Inasmuch as window glass cuts off all of the desirable ultra-violet radiation, a glass of better transmission would be of advantage. There is no doubt, however, that the importance of ultra-violet rays has been stressed too much, while the value of the infra-red radiation has been almost forgotten. According to experiments carried out by Loewy and the author, the infra-red rays of the sun spectrum in Spring and Winter penetrate deeply through the skin.

Figures of ultra-violet transmission through Vita glass and Ultravit glass are given; the transmission of wave length from 3,100 Å. to 2,900 Å. is particularly important. By multi-

plying the percentage of transmission for each wave length by a biological factor, for instance, the erythema effect according to Hausser and Vahle, one can get a very good idea of the clinical value of a particular glass.

E. A. POHLE, M.D.

Treatment of X-ray and Radium Burns. J. Eastman Sheehan. Laryngoscope, September, 1928, XXXVIII, 612.

In spite of care, dosage control, and the most recent forms of protection in our equipment, X-ray and radium burns still occur, although greatly reduced in number from those found a number of years ago. Dr. Sheehan reports eleven cases, treated for a variety of conditions, in which there was a definite burn, the result of carelessness or overdosage. He does not agree with some in the treatment of these conditions by means of further exposure to X-ray or ultra-violet, but feels that surgical treatment is the only procedure that promises any definite result. Let us hope that these mistakes may in the future be avoided altogether and that no treatment will be necessary for X-ray and radium burns.

B. C. CUSHWAY, M.D.

Experimental Investigations Regarding the Influence of Roentgen Rays on the Course of Inflammation in Comparison with Other Physical Methods. R. Motojima. Strahlentherapie, 1928, XXIX, 30.

The author studied experimentally the effect of roentgen rays and other physical agents on inflammatory processes. Catgut threads soaked in 5 to 10 per cent silver nitrate (chemical irritation) or catgut thread impregnated with staphylococci (bactericidal irritation) were buried under the skin of rabbits. It is essential to always compare symmetrical parts of the body, one part serving as control. Various doses of roentgen rays were applied. The tube ran at 180 K.V., with 0.5 copper filter, 720 *R*, corresponding to an erythema dose if measured on paraffin. The favorable effect of roentgen rays manifests itself in a reduced inflammation around the source of irritation—a medium dose gave the best results. It seems that both local and systemic processes are responsible for the beneficial effect of irradiation. The local effects are dilatation of the blood vessels, hyperemia, increased lymph flow, and changes in the local immunity. High doses seem to tend to abscess formation. The effect of roentgen rays on the inflammation is more similar to the effect of heat but not at all similar to the effect of cold. Combined treatment of heat and roentgen rays is more effective than treatment by either agent alone.

E. A. POHLE, M.D.

A Study of Resistance to Tumor Reimplantation in Rats Cured of Cancer by Radon. Kanematsu Sugiura and Stanley R. Benedict. Am. Jour. Roentgenol. and Rad. Ther., August, 1928, XX, 142.

The work reported in this article was done in an effort to determine whether the regression induced by radium in the Flexner-Jobling rat carcinoma would confer upon the inoculated animal any immunity to the development of a second tumor. Their experimental work consisted in implanting radon in both gold and glass tubes (to get, in the first instance, beta rays, and, in the second, gamma rays) into the central portion of solid tumors inoculated for from 14 to 50 days previously in the axilla of rats. The rats treated with beta rays showed a complete absorption of the tumor in 50 days as against 80 days for the rats treated by gamma rays, the explanation being that beta rays produce a complete necrosis while the gamma rays produce largely a partial necrosis.

Following absorption of the initial tumor, the same rats were re-inoculated in the opposite axilla with a second Flexner-Jobling carcinoma, and a series of the same number of control animals were inoculated with the same tumor for the first time.

The results of the experiments seemed to show that the series of rats having previously been "immunized" by beta ray radiation de-

veloped a higher resistance to re-inoculation with a second tumor than the rats which had been treated with gamma ray radiation.

J. E. HABBE, M.D.

The Radiation Treatment of Sarcoma of the Tongue. Albert Simons. Strahlentherapie, 1928, XXIX, 122.

The author discusses a case of interstitial carcinoma of the posterior part of the tongue, with involvement of the glands in the submaxillary region, which was cured by combined roentgen and radium treatment. Observation over a period of six and one-half years did not reveal any recurrence. This case shows that the possibility of cure by irradiation should be considered before doing a radical removal of the tongue.

E. A. POHLE, M.D.

Differential Diagnosis of Renal Tumors. William F. Braasch. Sou. Med. Jour., June, 1928, XXI, 425.

The clinical differentiation of different types of tumors is frequently possible by urography, supplemented by clinical and cystoscopic data. Renal neoplasms may be divided into two groups: (1) cortical tumors (hypernephroma, carcinoma, sarcoma, papillary cystadenoma, adenoma, and lipoma); (2) renal pelvic tumors (epithelioma, papilloma, leukoplakia).

The pyelogram in cases of hypernephroma or adenocarcinoma usually shows elongation of the calyces; the major calyces may be constricted and flattened throughout, and the minor calyces may be tapering, often hook-like; usually only one or two of the major calyces are involved. In cases of alveolar carcinoma, the growth is likely to involve the pelvic wall, causing abbreviation and irregular dilatation of calyces, instead of elongation and narrowing. In cases of difficulty in differentiating hypernephroma from polycystic kidney, a pyelogram of the other kidney should be made, as polycystic disease will show bilateral deformity. The benign tumors of the kidney do not show the common deformities of hypernephroma; there may be evidence of compression, with constriction and flattening of the pelvis and abbreviation of the calyces. Large solitary cysts usually cause a deformity which consists in abbreviation of adjacent calyces, compression and flattening of the adjacent portion of the pelvis, and change in position and axis of the kidney.

Cicatricial changes from chronic pyelonephritis may be difficult to differentiate from the deformities of tumor. Likewise it is often difficult to differentiate intrarenal and extrarenal tumors; displacement of the kidney pelvis in the pyelogram is of little significance, as it may occur in either; the pelvic deformity of intrarenal tumor is of more value.

Differentiation of the type of tumor, when possible, has great clinical value in treatment and prognosis.

W. WARNER WATKINS, M.D.

On the Influence of Dust and Dirt on the Transparency of Window Glass and Quartz in the Ultra-violet Region. W. Hausmann and O. Krumpel. Strahlentherapie, 1928, XXIX, 353.

The transparency of dusty quartz, special, and ordinary glass for ultra-violet rays entering at 90° was studied. An iron arc served as source of radiation. While the spectrographic examination did not show any difference between clean and dirty plates, it appeared that for visible light there was a loss of energy through the dust as shown photometrically. Different angles of incidence changed the results. At 45° it was still the same as at 90°, but at 30° the dust reduced the transparency. Tests with glass which was covered with dew proved that the transmission was the same if the radiation entered at 90°.

E. A. POHLE, M.D., PH.D.

Phleboliths. James R. Dillon and Bernard A. Cody. Calif. and West. Med., June, 1928, XXVIII, 800.

Only since the advent of X-rays have phleboliths become of clinical interest. That

phleboliths cast shadows was proven in 1908 by Clark and Orton, working independently. The presence of phleboliths indicates varicosity of veins, and since varicosities cause pain in the legs, testes, and in the pelvis of women when ovarian veins are involved, it is reasonable to suppose that they will cause pain in other localities. The paper is directed chiefly toward the significance of the well known phlebolith shadows in the pelvis. Report by Culligan, of the Mayo Clinic, is quoted, where, among 1,555 consecutive roentgenograms of the pelvis, 39 per cent showed phleboliths. The report of the writers is based on pelvic films and clinical histories of 900 patients examined at the Stanford University Medical School, of whom 31.7 per cent showed phleboliths. Special interest attaches to fifteen patients, twelve males and three females, in whom the varicosities as evidenced by phleboliths in the pelvis where the only ascertainable explanation for pain in the lower quadrants. They conclude that these varicosities have a definite clinical significance, which has been largely ignored in the past.

W. Warner Watkins, M.D.

Treatment of Fibroids. F. B. Mowbray. Can. Med. Assn. Jour., March, 1928, XVIII, 285.

While many enthusiastic radiologists regard radiation, either by radium or X-rays, as the only safe and satisfactory method of treatment of uterine fibroids, many surgeons would use radiation in only the cases where surgery is contra-indicated. The correct position is somewhere between these extremes. The author claims that radiation is not absolutely free from fatalities, just as surgery has a certain mortality. As illustration the author quotes a case which received a radiation burn and died from a complicating erysipelas. (To the reviewer this fatality would seem to have resulted, not from the use of radiation, but from its abuse in unskilled hands.)

The author would not use radiation therapy in a patient under forty, unless grave complications rendered surgery unsafe. He regards infections in the cervix or adnexa as contra-indications to radiation. Radiation would be restricted to patients over forty, whose nervous systems are stable, and where hemorrhage is the prominent feature, and where tumors range in size from small nodules up to freely movable ones as large as a three months' pregnancy, providing these tumors are not sub-mucous, pedunculated, degenerating, or rapidly growing, and that the uterus is otherwise normal.

Whether radium or X-ray should be employed depends on circumstances. X-ray is easier to apply and may cause the patient less inconvenience. Radium usually causes more prompt cessation of bleeding, and produces less effect on neighboring organs. Radium, well screened, is placed in the uterine cavity, well up to the fundus, and a 600 to 900 milligram-hour dose is delivered.

L. J. Carter, M.D.

The Roentgen-ray Diagnosis of Pulmonary Infections with the Friedlander Bacillus. Karl Kornblum. Am. Jour. Roentgenol. and Rad. Ther., June, 1928, XIX, 513.

Four cases of Friedlander's Bacillus infection in the lungs have been studied by frequently repeated roentgenograms, three of the patients progressing to clinical cure. The roentgenologic findings are classified into four groups, which correspond to the several stages of the clinical course of the disease when it progresses to a cure. These stages are: bronchopneumonia, pseudolobar pneumonia, multiple abscess and cavity formation, and, finally, healing by fibrosis. Clinically, the onset may be insidious or acute, and early in the disease lobar pneumonia is usually suspected. Following a few days of acute symptoms the patient may experience a remission, after which the temperature again rises and assumes the septic form, at which time tuberculous pneumonia may be considered; however, the sputum studies will be consistently negative for the tubercle bacillus. If the outcome is to be favorable, the temperature grad-

ually subsides and the physical signs clear up but may not disappear entirely.

In the initial stage of bronchopneumonia the X-ray findings differ from the ordinary bronchopneumonia in that the areas of pneumonic clouding are not usually bilateral or predominantly basal. In the stage of pseudolobar pneumonia the areas of clouding coalesce but seldom show an exact lobar involvement. If frequent X-ray examination is made during this stage it will also be noticed that the areas of consolidation begin at the hilus and extend toward the periphery and resolution occurs in the same order. In the third stage multiple abscesses are visualized, and in this stage the lateral roentgenogram is recommended. If the patient survives, fibrosis sets in, with the cavities remaining thin-walled as a rule, in contradistinction to the chronic tuberculous cavity.

It has been suggested that many cases of bronchiectasis may represent the end-result of former Friedlander infections.

J. E. Habbe, M.D.

Carcinoma of the Cervix during Pregnancy, with Consideration of the Question of Injury to the Offspring by Irradiation. Robert Zimmermann. Strahlentherapie, 1928, XXIX, 108.

Since 1919, five cases of carcinoma of the cervix in pregnant women have been observed in the Gynecological Clinic of the University of Jena. Two of the women died shortly after delivery; one entered the hospital a year later with a recurrence. These women were all about six or seven months' term. The treatment consisted of cautery of the tumor and application of mesothorium and roentgen rays. The fourth woman came under observation in the second month of pregnancy. A polyp of the cervix was removed and its base cauterized, while the pregnancy continued normally. The last case received a total of 4,390 milligram-hours radium element, after which a normal child was born which seemed to develop well—weight and height were always slightly above average. When the child entered school, it could not follow the lectures; the neurologist made a diagnosis of microcephaly. While from this one case no definite conclusions can be drawn as to the injurious effect of radiation during pregnancy, it suggests the advisability of observing children born under such conditions over a long period. If it should appear that such children develop abnormally, the indication for interruption of the pregnancy would be given.

E. A. Pohle, M.D.

Certain Factors Militating against Accurate Correlation of Physical and Roentgen-ray Examinations of the Chest. F. M. Pottenger. Am. Jour. Med. Sci., May, 1928, CLXXV, 676.

After discussing the proper relation and relative values of the physical examination and the X-ray examination of the chest, this author enters into more detailed discussion of the reasons for errors in many roentgenographic interpretations. The summary of his conclusions is as follows:

1. The findings on physical and roentgen-ray examination of the lungs show some variation in nearly all instances, and in a small percentage the differences are very marked.

2. The ability of the disease process in the lung to produce shadows depends upon the power of the various elements making up the structures to intercept the rays, and this varies approximately according to the fourth power of the atomic number of their composing elements. Therefore, on the plate, small lesions may show perfectly if composed of elements whose atomic number is high, and large ones may not show at all if the atomic number of the chief component elements is low.

3. Lesions nearest the plate (taken at a distance of 40 inches) show best, because the tissues nearest the tube are overpenetrated and consequently fail to intercept the rays and produce shadow. Therefore, there is considerable variation in plates taken antero-posteriorly compared with those taken postero-

anteriorly. If a small lesion lies near the surface of the chest wall nearest the tube, it may not be detected at all by the roentgen ray. This error is lessened, but not eliminated, if the tube is some distance from the patient.

4. When small lesions are suspected on physical examination, the patient should be placed dorso-ventrally if the lesion is suspected anteriorly, and ventro-dorsally when suspected posteriorly, or, what is better, plates should be taken in both directions.

W. WARNER WATKINS, M.D.

On the Influence of Roentgen Rays on Vitamin-free Food Stuff. F. Rost and W. Dieterich. Strahlentherapie, 1928, XXIX, 152.

A number of investigators studied the effect of roentgen rays on food, but came to different results. This paper relates experiments carried out on 125 white rats that were fed with food made vitamin-free by heating it. Irradiation of such food did not cause any injury to the animals; on the contrary, if vitamin-free bacon was irradiated, they seemed to do better. However, this improvement never reached the point that can be attained by exposing the food to ultra-violet radiation.

E. A. POHLE, M.D.

The Azygos Lobe of the Lung. Arthur J. Bendick and H. Wessler. Am. Jour. Roentgenol. and Rad. Ther., July, 1928, XX, 1.

In this article the authors submit the first correlated autopsy evidence to show that a peculiar linear convex shadow occasionally visualized in the right upper chest on the roentgenogram actually represents the fissure between the right upper lobe and the azygos lobe. This lobe occurs only when the azygos vein persists in its fetal position, a little distance lateral to the spine. This vessel, which passes from the posterior chest wall to its point of entrance into the superior vena cava, carries with it a reflection of parietal pleura which occupies the fissure between the azygos lobe and the remainder of the upper lobe. The azygos vein occupies the lower part of the fissure and casts a denser ovoid shadow, due to the confluence of this vein with the superior vena cava. In addition to the two cases coming to autopsy in which the roentgen evidence of the presence of an azygos lobe was confirmed, two cases showing X-ray evidence of azygos lobe pathology—one of effusion between the azygos and upper lobe, and one of chronic induration of the azygos lobe—are reported.

J. E. HABBE, M.D.

The Chronic Gall Bladder. John B. Deaver. Can. Med. Assn. Jour., June, 1928, XVIII, 666.

Apart from chronic appendicitis, chronic disease of the gall bladder is the most common cause of epigastric discomfort. One of the difficulties which confronts the internist and the surgeon is the evaluation of early symptoms. In the case of the gall bladder, this difficulty is being, to some extent, overcome by cholecystography, the Graham-Cole method of diagnosis. This should be especially valuable in early cases, where the lesion is still functional, and not yet organic. The question arises as to what degree of functional derangement, as shown by the cholecystogram, warrants operative interference. It is the author's opinion that the clinical aspect of the case should receive most attention. In the absence of a definite clinical picture, even though the cholecystogram indicated functional derangement, he doubts whether operation would give the desired result. On the other hand, with definite clinical symptoms, even the absence of cholecystographic findings would not contra-indicate operation.

L. J. CARTER, M.D.